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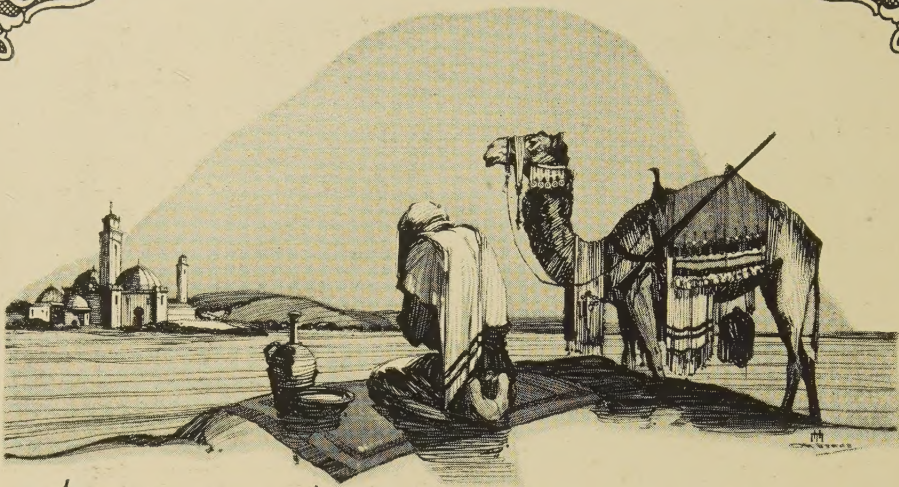
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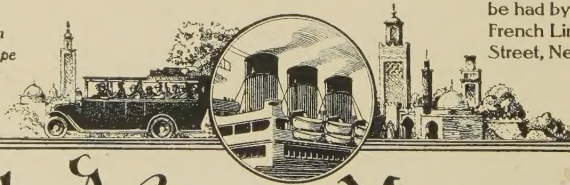
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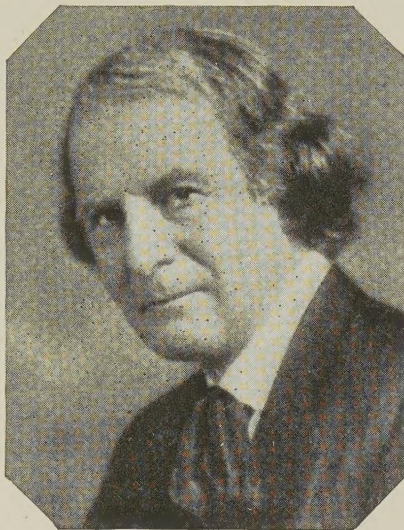
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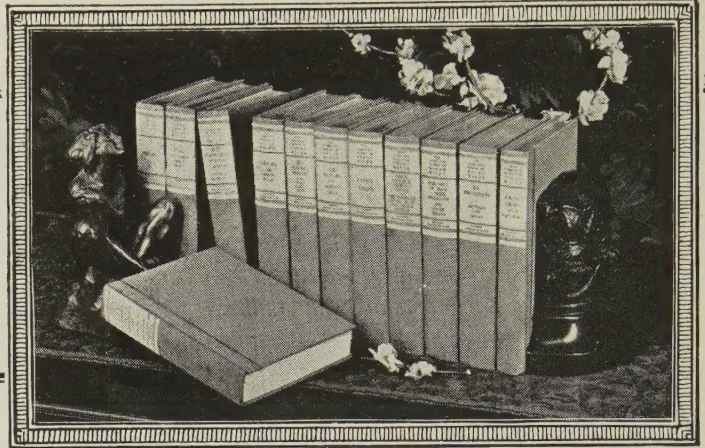
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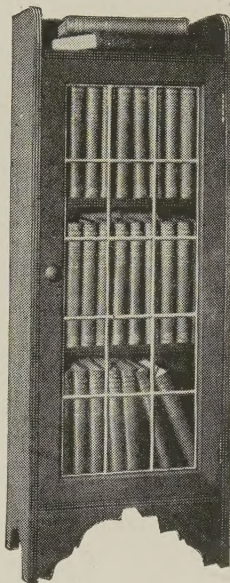
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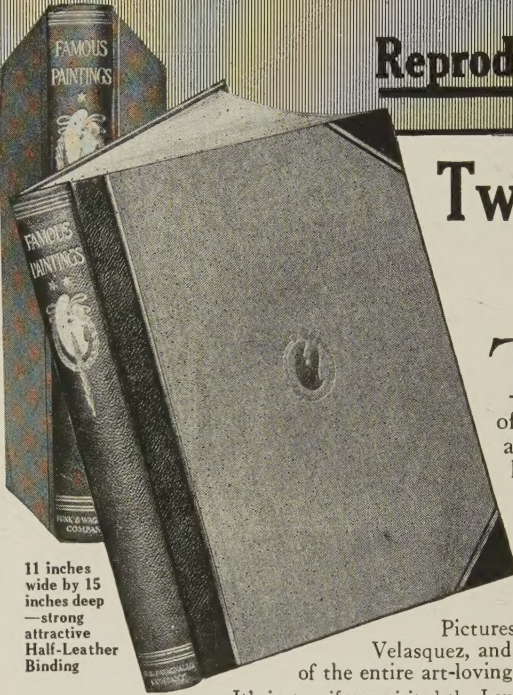
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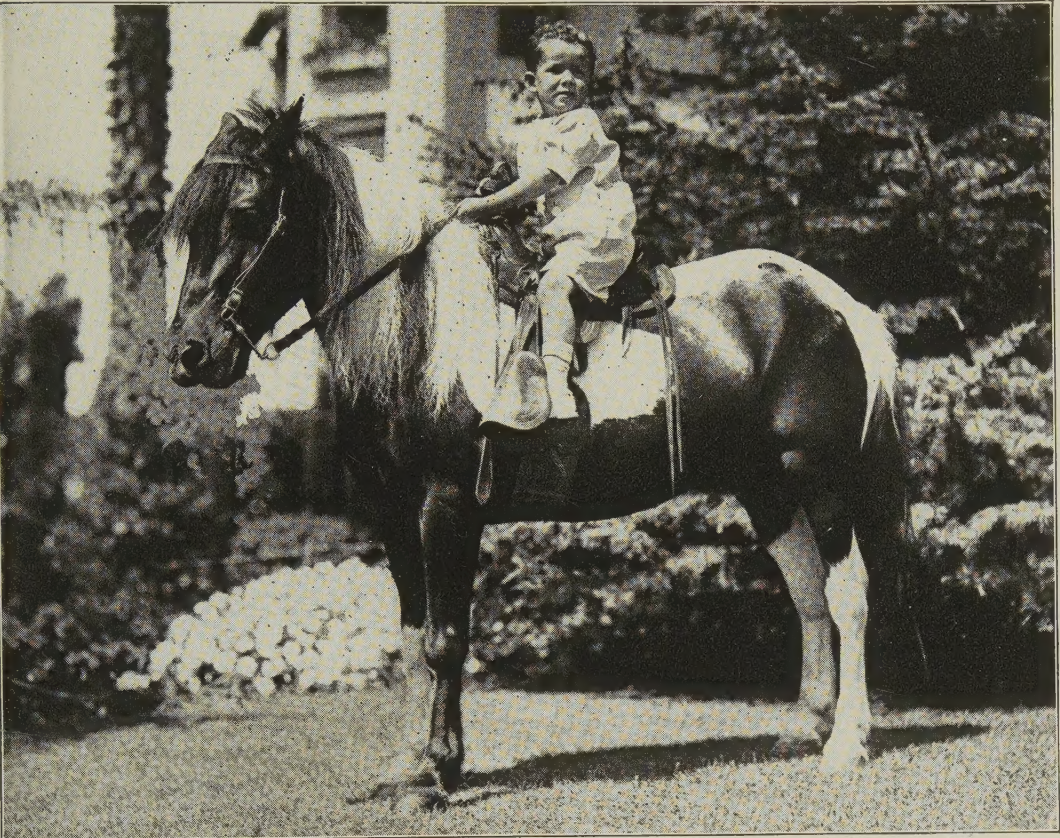
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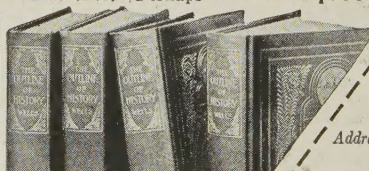
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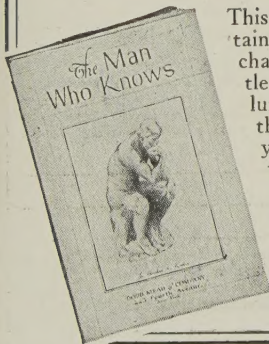
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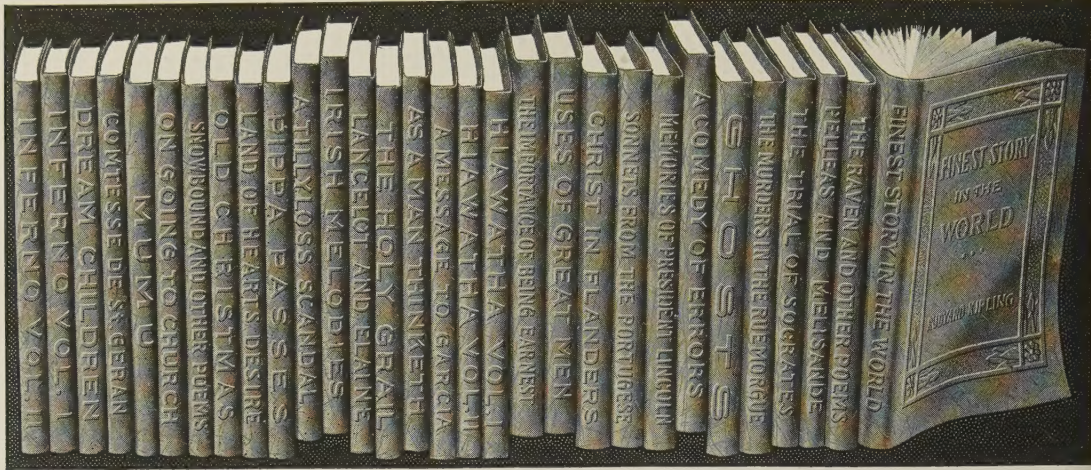


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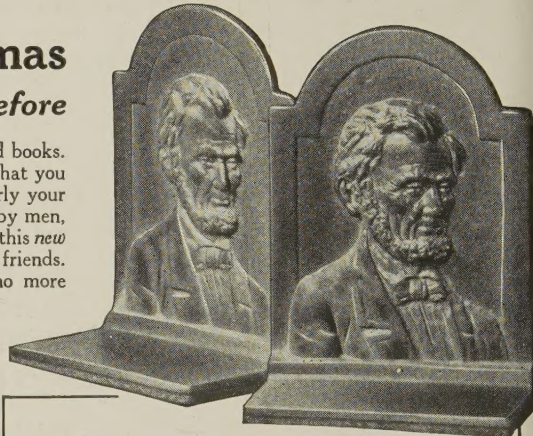
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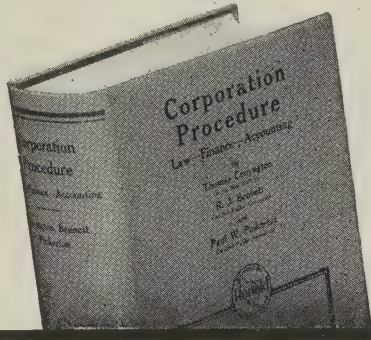
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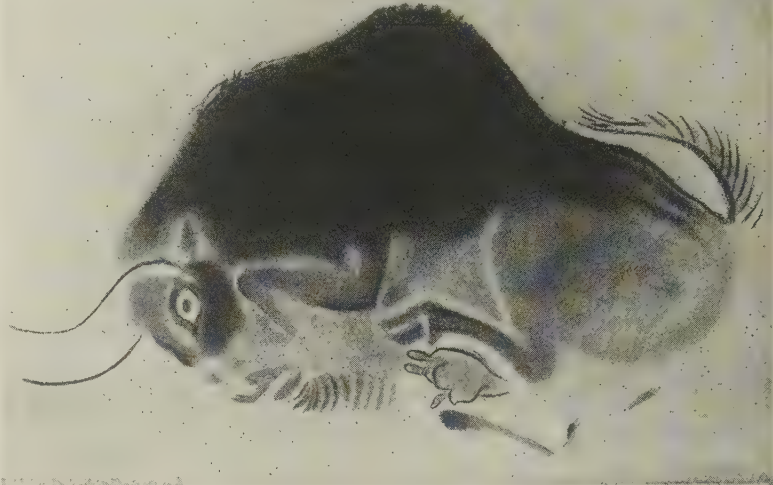
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HARPER & BROTHERS

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In accordance with your special examination offer please send me the volume checked below of Elie Faure's "History of Art." I will keep the volume for ten days and at the end of that time will either send you \$7.50 or return the book to you.

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How Ten Minutes' Fun Every Day Keeps Me Fit

By Walter Camp

Famous Yale Coach's "Daily Dozen" Exercises
Now on Phonograph Records

ONE night during the war I was sitting in the smoking compartment of a Pullman sleeping-car when a man came in and said, "Mr. Camp?" I told him I was, and he continued, "Well, there is a man in the car here who is in very bad shape, and we wondered if you could not do something for him."

"What is the matter?" I asked.

"This fellow is running up and down the aisle in his pajamas," the man said, "trying to get them to stop the train to let him get some dope because he hasn't slept for four nights."

I went back in the car and found a man about 38 years old, white as a sheet, with a pulse of 110, and twitching all over. I learned that he had been managing a munitions plant and had broken down under the work because he had transgressed all the laws of nature, and given up all exercise, and had been working day and night.

"For God's sake," he said to me, "can't you put me to sleep? If somebody can only put me to sleep!" He was standing all bent over.

"Don't stand that way; stand this way!" I said, and I straightened him up and started putting him through a few exercises to stretch his body muscles. Pretty soon the color gradually began to come back into his face, and the twitching stopped. Then I said to him, "I am going to put you through the whole set of 'Daily Dozen' exercises once. Then I am going to send you back to your berth."

So I did that and didn't hear any more from him, but the next morning he came to me in the dining-car and said:

"You don't leave this train until you've taught

me those exercises. I slept last night for the first time in five nights."

I taught him the "Daily Dozen" and two months later I got a letter from him saying:

"My dear good Samaritan, I am back on the job all right again, and I am teaching everybody those exercises."

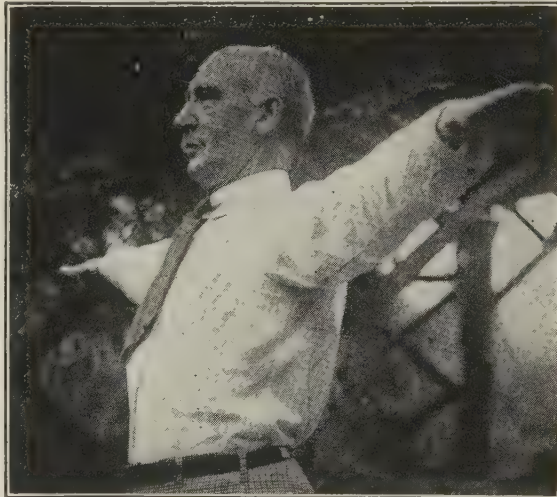
The "Daily Dozen" was originally devised as a setting-up drill for picked young men—the boys who were in training during the war. But its greatest value is for those men and women who are hemmed in between four walls most of the time and are beginning to realize that their bodies aren't as fit as their minds.

I applied it to middle-aged men, and men past middle age too,

during the war—including members of the Cabinet in Washington—who simply had to do much more work than they were used to doing, without breaking down. In the "Daily Dozen," I soon found I had something that would actually increase their reserve power. They grew progressively more fit as we went along.

People think that they can take an orgy of exercise and make up for a long period of neglect when they do not take any exercise at all. You cannot do that. Do not go to a gymnasium. That tires you to death. That is old-fashioned. We do not have to do that any more. A man or woman can keep himself or herself fit with six or seven minutes a day. There is no reason why a man at 50 or 60 or 70 should not be supple; and if he is supple, then he grows old very slowly—but the place where he must look after himself is in his body muscles.—*Walter Camp.*

Mr. Camp is famous as a great Yale football



WALTER CAMP
Originator of the Famous "Daily Dozen" System

coach, and athletic authority, but few people know that he is also a successful business man. Although sixty years old he is stronger and more supple than most younger men, and he uses his own "Daily Dozen" exercises regularly in order to remain so.

Since the war, the "Daily Dozen" has been making busy men and women fit and keeping them so—and the exercises are now proving more efficient than ever—due to a great improvement in the system. This is it:—

With Mr. Camp's special permission, all the twelve exercises have been set to music—on phonograph records that can be played on any disc machine.

In addition, a book is included—showing by actual photographs the exact movements to make for every one of the "commands"—which are given by a voice speaking on the record. So now you can make your phonograph keep you fit.

With these records and the book a man or woman can keep himself or herself fit with only a few minutes exercise a day—and it is so much fun that some of the "Daily Dozen" fans go through the whole twelve exercises to the spirited music *twice* every morning—just as a matter of sheer enjoyment.

Mr. Camp says that the place where we must look after ourselves is in *the body or the trunk muscles*.

This is so because we are all in reality "caged animals." When a man stops hunting and fishing for his food and earns it sitting at a desk he becomes a captive animal—just as much as a lion or a tiger in the Zoo—and his trunk muscles deteriorate because they cease to be used. Then comes constipation and other troubles which *savage* men never have.

The remedy is to imitate the "exercises" of caged animals. *They* know how to keep themselves fit—and they do it, too.

How? Simply by constantly stretching and turning and twisting the trunk or body muscles! When Mr. Camp discovered that men and women can imitate the caged animal with enormous profit to their health, he devised the "Daily Dozen"—to provide this indispensable exercise—the only exercise people really need to keep in proper condition.

Many people have written to the Health Builders telling them of the benefits they have received. Here is part of one letter:

"We wish to express our satisfaction and delight with our set of records and exercises. Our entire family of eight, including the maid, are taking them. The children are fascinated with them and bring the neighbors' children to do them."
—MRS. CHARLES C. HICKISCH, 828 Vinc St., La Crosse, Wis.

The Health Builders' improved system now includes the entire "Daily Dozen" exercises, set to specially selected music, on large 10-inch double-disc phonograph records; a handsome book, printed

in two colors, containing over sixty actual photographs illustrating each movement of each exercise; and a foreword by Walter Camp explaining the new principles of his famous system.

Any man or woman who exercises with this system regularly, even if it is only six or seven minutes a day, will feel better and have more endurance and "pep" than they have had since they were in their 'teens—and they will find those few minutes the best fun of their day.

Try the Complete System Free—For Five Days

You cannot fully appreciate the real joy of doing the "Daily Dozen" to music until you try it. So we want to send you, absolutely free for five days, the "Daily Dozen" on phonograph records and the book which illustrates the movements. These full-size, ten-inch, double-disc records playable on any disc machine contain the complete Daily Dozen Exercises, and the 60 actual photographs in the book show clearly every movement that will put renewed vigor and glowing health into your body—with only ten minutes' fun a day. A beautiful record-album comes free with the set.

No need to send any money. Simply mail the coupon below and get Walter Camp's "Daily Dozen" on phonograph records. Enjoy the records for five days, and if for any reason you are not satisfied, return them and you owe nothing. But if you decide to keep the records, you can pay for them at the easy rate of only \$2.50 down, and \$2 a month for four months until the sum of \$10.50 is paid. Thousands of people have paid \$15 for the same system but you can now get it for only \$10.50 if you act at once.

Simply mail the coupon and see for yourself at our expense, the new, easy, pleasant way to keep fit. You'll feel better, look better, and have more endurance and "pep" than you ever had in years—and you'll find it's fun to exercise to music! Don't put off getting this remarkable System that will add years to your life and make you happier by keeping you in glowing health. Mail the coupon to-day. Address Health Builders, Inc., Dept. 7211, Garden City, N. Y.

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Please send me for five days' Free Trial at your expense the Complete Health Builder Series containing Walter Camp's entire Daily Dozen on five double-disc ten-inch records; the book containing the 60 actual photographs; and the beautiful record-album. If for any reason I am not satisfied with the system, I may return it to you and will owe you nothing. But if I decide to keep it, I will send you \$2.50 in five days (as the first payment) and agree to pay \$2 a month for four months until the total of \$10.50 is paid.

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Hundreds of words you use are almost the same in French, Spanish and German.

Here are over 50 from a page of a New York paper

reaction	eminent	brutal	command
conservative	national	police	moral
tendency	class	capitalist	revolution
illustrate	energetic	administration	conspire
contraction	industrial	inspection	conference
theory	interest	problem	delegate
absolute	organization	commissioner	historical
dictator	department	naturally	consequence
political	creature	liberal	ideal
social	confiscate	aspiration	action
ethical	character	aristocracy	agitation
practical	person	element	imperial
ignore	demonstration	constellation	situation



No wonder Americans find it so easy to talk and read foreign languages by the amazing new Pelman system!

Everybody wants to be able to talk and read at least one foreign language—either for traveling abroad, or for business reasons. A revolutionary discovery now enables Americans to master French, Spanish or German with surprising ease. Get the **FREE BOOK** that gives you the most astonishing information ever published about learning languages in the only **natural** way in your own home.

IF SOMEBODY handed you a foreign newspaper and told you to read it at sight, you would probably say:

"Impossible! Why, I don't know a word of any language but English!"

Yet the amazing fact is that you do actually know hundreds of words of French, Spanish, and German—without realizing it. Hundreds, yes thousands, of words are almost identical in English and in the three principal foreign languages. Over 50 of them, printed in the panel above, were taken from a single American newspaper page.

What does this mean? Simply that you **already** have a start toward learning any language you choose, by the easiest, most efficient method ever devised.

This is the Pelman Method of Language Instruction—a wonderfully simple way of teaching that has been enthusiastically received in England, and has just been brought to America. You learn in the simplest, most **natural** way imaginable—the way a child learns to speak his native tongue—without bothering about rules of grammar at all in the beginning.

First You Learn to Read the Language at Sight

Let us suppose, for example, that you have decided to learn French. (The Pelman method works just as simply with the other languages.)

When you open the first lesson of the Pelman method, you will be surprised to see not a single word of explanation in English. But you soon realize that no English is necessary. You find that you already know enough French words to start—words that are almost the same in English—and that you can easily discover the meaning of the unfamiliar French words by the way they "fit in" with the ones you recognize at sight. Your interest is seized and held at once with all the fascination of a game.

In the places where it is necessary, you get the meaning of new words from little pictures of the things the words stand for—but the principle of using words you already know to teach you whole new sentences works so well that you literally read the course from beginning to end in French, and at sight.

And You Begin to Speak Before You Realize It

After only eight to twelve weeks you will be able to read books and newspapers in the language you have chosen—and, almost before you realize it, you will find yourself able to speak that language more fluently than students who have studied it for years in the toilsome "grammar-first" way.

Mr. M. Dawson-Smith, an English student of the Pelman system, writes:

"A short time ago a Spanish lady was staying in the neighborhood. I practiced my Spanish on her, and she congratulated me both on my accent and fluency, and was amazed to hear that I had learnt it all from correspondence. She has lent me several Spanish books which I can read with the greatest ease."

And the remarkable results gained by hundreds of others who have taken the Pelman language courses were not attained by a toilsome struggle with rules of grammar, or by laboriously memorizing long "vocabularies" of words.

Every lesson keeps you interested and fascinated, eager for the next. You pick up the points of grammar that you need **automatically**—almost unconsciously. It is only after you can already read and speak readily that the subject of grammar

is touched at all—but correct pronunciation and accent are taught from the first lesson—and a remarkable new invention has made this part of your progress astonishingly easy.

Remarkable Book Free

What do you know about the remarkable opportunities that have been opened up since the war to those who know one or more of the great foreign commercial languages? The amazing free book that you can have for the asking tells you all about them. It shows you what a real business asset it is to have another language at your command. The man or woman who knows two or more languages is needed in business more than ever before.

You have had here only a glimpse, a mere hint, of the fascinating and enjoyable way you can now learn any foreign language through the amazing Pelman method. The big, free book gives you a convincing demonstration of the method in operation—actually teaches you to read at sight a page of the language you select to learn!

Whether you now have the desire to learn another language or not, you will be fascinated by the interesting facts about languages that this book gives you.

The coupon below will bring you full information about the Pelman system of language instruction. Sending for it costs you nothing and obligates you to nothing. **Mail the coupon today.**

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☐ French ☐ Spanish ☐ German

RIDING THROUGH SPACE

THE EARTH'S SCENIC VOYAGE

BY GARRETT P. SERVISS



AN EXPLODING METEORITE

With the noise of bombarding guns, these visitors from the outer spaces tear their way in a line of fire through the atmosphere, explode with scintillating flashes of light and fall upon the earth in a solid mass or in small fragments, or perhaps in fine dust

WE ARE taking a wonderful speed-ride on this globe of ours, year by year and century by century, through the limitless spaces of the Universe. Along our whirling course amazing things are all about us—some far distant, some close by, and others that hit us as we go. Personally conducted by Mr. Garrett Serviss, we now have some of the wonders of the Great Outside pointed out to us.

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LARGEST METEORITE
FOUND IN THE
UNITED STATES

This celestial visitor, now in the American Museum of Natural History, New York, was found in the forest nineteen miles south of Portland, Oregon. It weighs 31,107 pounds, is ten feet long, six feet six inches high, and four feet three inches thick. Chemical analysis shows that it contains ninety-one per cent iron, eight per cent nickel and small amounts of cobalt, sulphur, and phosphorus. The assumption is that the large pitholes were caused by exposure to the elements



THE MENTOR



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RIDING THROUGH SPACE

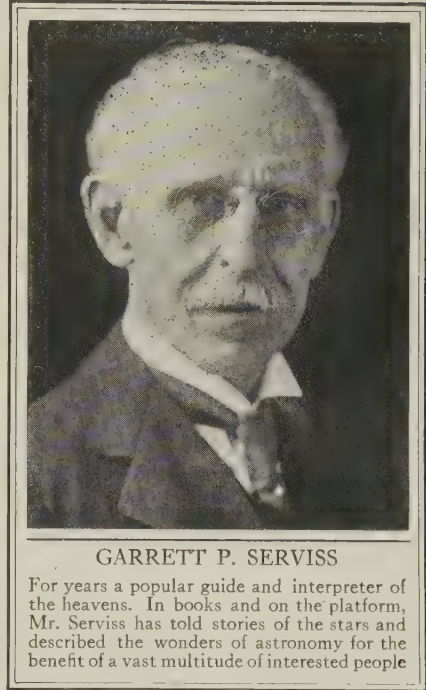
The Earth's Scenic Voyage

BY GARRETT P. SERVISS

Borne along on our little earth globe, we are making an interminable journey, so stupendous in its sweep, so wonderful in its character, so unlike anything that the human imagination could have invented, that language becomes faint in the effort to describe it. And in this great journey the earth that carries us is only one of the smaller companions in a large company of space voyagers, which includes the sun as leader, together with all its attendant planets, planetoids, and other regular followers and dependents. We are a part of a big traveling show which sweeps spectacularly along the limitless highway of space at a speed of no less than 378,000,000 miles per year.

And, as we thus travel onward through universal space, marvelous sights come into view, and strange happenings occur. Some things that we cannot see we feel as we pass through the field of their influence. They come upon us like mysterious clouds. Then, too, there are objects that might be likened to the stones and gravel that fly from the roadbed beneath a rapidly traveling train; for thus the earth feels the stinging blows of missiles that dart at us as we speed on our ringing way. Our museums contain many specimens of these strange bolts that have been shot at our planet. At the Smithsonian Institution in Washington, at the Natural History Museum in New York, at the Field Museum in Chicago, at many of the university museums, and elsewhere some wonderful examples may be seen. One of those found by Peary, which struck in Greenland, weighs thirty-six and one-half tons. One that hit the earth in Arizona made a hole as large as a volcanic crater.

In addition to these things, which anyone can see who will, there are sights that we, like an inexperienced voyager, would miss or fail to appreciate, if they were not pointed out and explained to us. This is a service that



GARRETT P. SERVISS

For years a popular guide and interpreter of the heavens. In books and on the platform, Mr. Serviss has told stories of the stars and described the wonders of astronomy for the benefit of a vast multitude of interested people.

RIDING THROUGH SPACE

astronomers render to their fellow voyagers over the ocean of infinite space.

Most of us no doubt think that the little globe on which we live simply whirls around on its axis once every day, and revolves around the sun once every year, coming back at the end of every twelvemonth to the same position in space that it occupied before. That was, indeed, the old and very natural idea entertained by everybody until Herschel showed by the "opening out" of the stars around the constellation Hercules in the northern heavens, and their "closing in" toward the constellation Argo at the opposite point of the sky, that the sun, taking the earth and its other planets along with it, must be moving rapidly through interstellar space in a northerly direction.

The discovery of Herschel's, made more than a hundred years ago, is the basis of our knowledge of the immense voyage with which we are dealing. The distant stars are like coast beacons whose slowly shifting positions not only indicate to us, voyaging through the great night, that we are in motion, and the direction of our motion, but even enable us to calculate the speed with which we advance. The visual effect has often been correctly likened to what one observes in walking through the woods, where the trees ahead seem to separate and those behind to draw closer together. But, on account of the immense distance of the stars, their apparent motions, due to the advance



A ROOM FULL OF
VISITORS FROM ❖
OUTER SPACES ❖

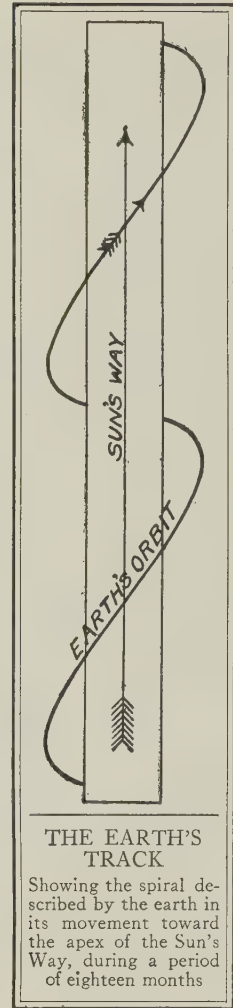
The Ward-Coonley collection of meteorites in the Field Museum, Chicago. Meteorites vary in size from fine dust to huge boulders weighing tons. The largest known mass was found at Bacubirito, Mexico, and is estimated to weigh fifty tons. The number of stones that reach the ground from one fireball is variable. At one place in Poland it is estimated that not less than 100,000 reached the earth's surface. They are generally found warm to the touch if dug up immediately, but they are not hot enough to char wood. They are presumably cold when they enter the earth's atmosphere and become heated by friction as they pass through the air

of the solar system, are so slow that many years must elapse before their change of place becomes evident to the naked-eye observer.

But when we come to the effect of this motion upon our own position in the universe and our relation to the space immediately around us, we obtain some surprising impressions. Every year we advance 378,000,000 miles nearly in the direction of the star Vega, or Alpha Lyræ, one of the brightest and most beautiful in the heavens. Now, since at the same time the earth must go around the sun in the course of the year, it is evident that its track is not a circle or an ellipse, always lying in the same plane, but a spiral, in shape like a spiral spring. The track of the sun, which resembles the axis of the spiral, may be called a straight line. But the earth and all the other planets that circle around the sun, and at the same time advance with it toward Alpha Lyræ, must travel in spirals. It is a grand planetary waltz, led by the sun, and whirling away and away into the star depths. There they go—Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, each bearing along its moons if it has any (as most of them have), while, tripping in step with the others, goes the merry ring of the tiny planetoids, or asteroids, together with all the captured comets and other semi-alien attendants of the brilliant leader. The spiral of Mercury is 72,000,000 miles in diameter, that of the earth 186,000,000, that of Jupiter 966,000,000, that of Neptune, the farthest, 5,600,000,000; but all of them, no matter how large or small the diameter of their respective spirals, keep abreast in the advance toward the north, which is 378,000,000 miles a year for each.

Now think of what comes of this yearly forward motion of 378,000,000 miles. The first striking result is that we are *never twice in the same location in space*. Probably many of us have taken comfort in the idea that we get back to the same place every New Year's day; but we do nothing of the kind. In consequence of the great journey, anniversaries occur only in *time*, never in *space*. We go back to the old home at Christmas, but, although the old home is at the same spot on the earth, yet we eat the Christmas turkey 378,000,000 miles from the place in the universe where we ate the turkey the year before. Between two successive birthdays we are carried through interstellar space a greater distance than we would have to go in circling the earth fifteen thousand times at the equator, where it is largest.

But let us look at it from the viewpoint of history, both human and geological. The most modest estimate of the date of the first appearance of



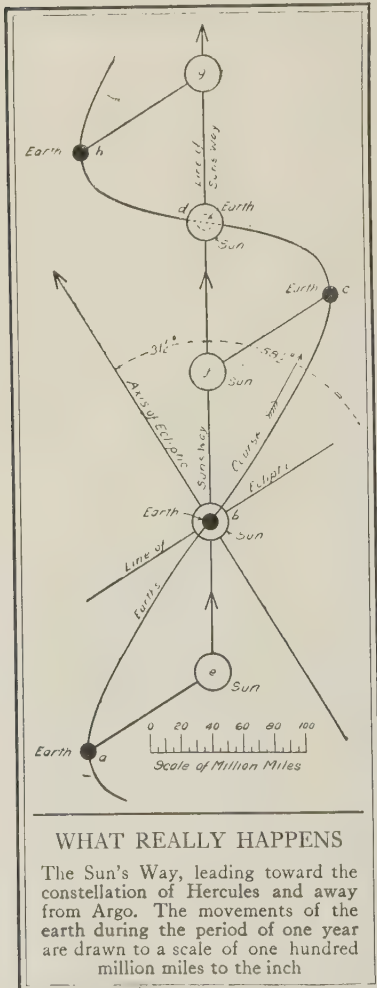
primitive man puts it back at least twenty-five thousand years. Well, in those twenty-five thousand years the earth has traveled onward toward Hercules and Lyra, in the northern heavens, nine trillion four hundred and fifty million miles, which is over one third of the distance to the nearest fixed star, Alpha Centauri.

Many geologists and paleontologists, however, may tell you that the first appearance of man ought to be dated not less than two hundred thousand years ago, if not half a million years. But two hundred thousand years ago this planet and its sun were twenty-five trillion miles farther away from their present position in space than Sirius, the Dog Star, is now, and the first human eyes must have looked up at constellations so different in the arrangement of their stars from those that we see that they would be unrecognizable to the star gazers of to-day.

Then, if we let go the brief life line of human history and pre-history, and fall back into the depths of the geologic past, the voyage of the earth assumes a magnitude and a grandeur that stagger the imagination. Taking the small

estimate of fifty million years for the space of time elapsed since the animals whose remains are found in the Silurian rocks were living, we find that since their fossilized shells, specimens of which you can take into your hands in any museum, were occupied by the creatures that made them, the earth has traveled nearly nineteen thousand millions of millions of miles. This is a distance equal to more than three thousand light-years, the light-year being the astronomer's tremendous celestial yard stick, which multiplies the 186,330 miles that light travels in one second by the number of seconds in a whole year! And yet we are not done, for there are geologists and biologists who claim that anywhere from two hundred million to two thousand million years must have elapsed since life began on the earth. With even the smaller of these estimates for a basis we find that the earth when it became a habitable globe may have been as far away from its present position as the *entire diameter of the Milky Way!*

So far we have only turned our faces backward, along the interminable road that our planet has already traveled through the star-strewn tracts of immensity. Now let us just glance at what appears to lie ahead. As I have



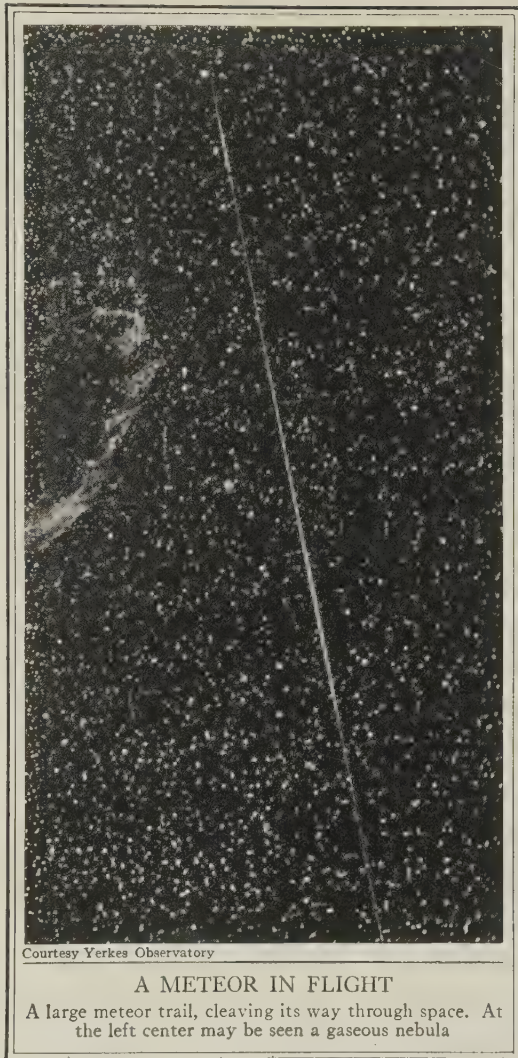
said, our course is directed nearly toward the brilliant Vega, or Alpha Lyræ, or toward the eastern border of the constellation Hercules. We have seen that the paths of the planets are spirals surrounding that of the sun, which forms a central axis for the whole system. Whether the sun's path is really a straight line or a curved one is a question. There are reasons for affirming that it must be curved, but the radius of curvature is so great that nothing has yet been learned about it. To all appearance, then, it may be said that the mighty track of the solar system runs straight on. We are entering continually into new regions containing we know not what.

A slight variation from what seems now to be our direction, a change of perhaps not more than four or five degrees, would set the great star of the Lyræ straight over the bow. On the exceedingly improbable, not to say impossible, supposition that Alpha Lyræ may be the destined goal of our journey, we ought to get there in about 600,000

years. That is, *if Alpha Lyræ stood still and waited for us*. But with regard to the question of an encounter with any particular star or other object in space it is to be remembered that *not only we but likewise all the stars and all the nebulae are in motion*. And many of these objects are traveling much more rapidly than the solar system. Moreover, their motions are in all sorts of directions, although many clusters of stars, some dense and others widely scattered, travel together in companies. The sun seems to belong to one of these dispersed tribes of stellar Bedouins, whose members are so widely separated that their individual influence upon one another is imperceptible. There is abundance of room in space, and yet the phenomena of new stars suddenly blazing up like explosions or conflagrations seem to show that collisions do occur.

Let us take up the adventures and the sights by the way.

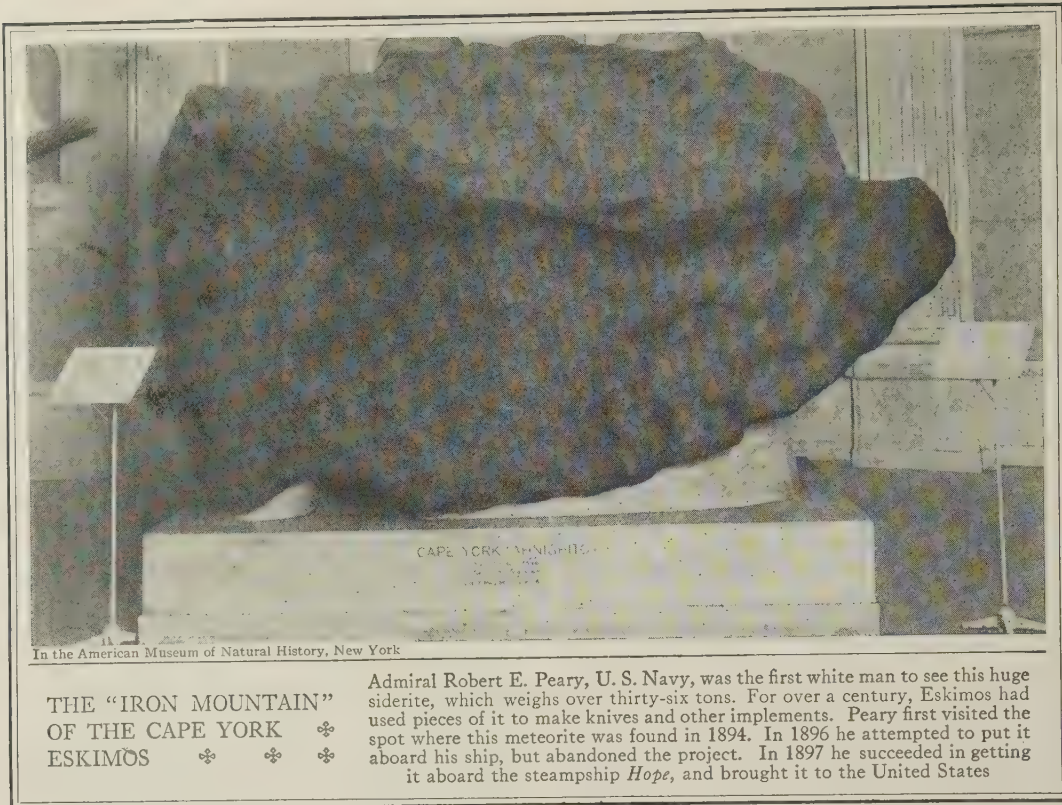
Everybody has occasionally seen a "shooting star," gliding like a mys-



Courtesy Yerkes Observatory

A METEOR IN FLIGHT

A large meteor trail, cleaving its way through space. At the left center may be seen a gaseous nebula



terious spark in the high heavens, and in a moment disappearing. Some have witnessed "showers" of these celestial sparks, when they seem almost as thick as fiery snowflakes. There was an appalling spectacle of that kind beheld all over the United States on the night of November 13-14, 1833. That was the most famous "meteor shower" on record. But there was another only less magnificent in 1866, and a brilliant one in 1872, and many others have been noted in ancient traditions as well as in modern scientific records. Some less startling displays occur every year, like the August and November meteors.

These things come from outside the earth. If the earth were not voyaging through space, we should not encounter them. It is true that the periodic meteor swarms accompany the sun in its onward movement, and thus may be said to be joined in the great journey of the solar system; but we see nothing of them except when they plunge into the earth's atmosphere, and so produce incidents and accidents by the way. The great planetary members of the squadron are safe against mutual encounters, but they run down crowds of tiny bodies that swarm across their tracks.

Besides, it is possible that many, perhaps most, of the sporadic shooting stars, which appear singly, and are to be seen any night, have been drawn into the solar system from the vast ocean of surrounding space through which it is advancing, as a leaping dolphin or a whizzing flying fish suddenly darts

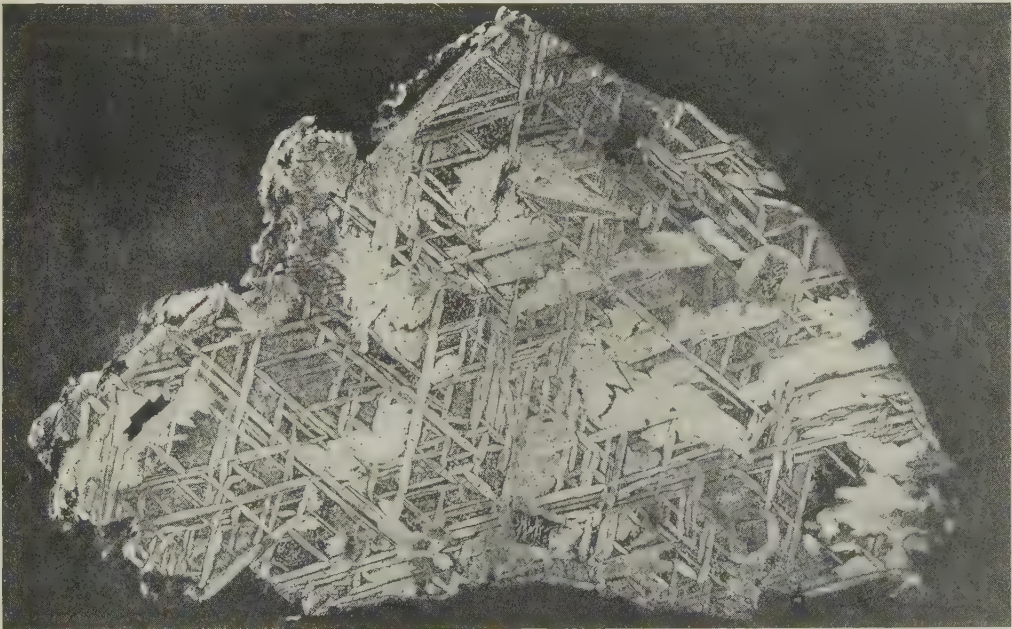
RIDING THROUGH SPACE

into view from the deck of an Atlantic liner. Or they come out of the black depths like the phosphorescent sparkles that rise under the keel.

And what becomes of them? The heat of friction makes the air hotter than a furnace around them, and they are burned up—changed in an instant to gas and dust. Then probably we breathe in an all but infinitesimal quantity of that meteoric dust and gas, descending mixed with the air, as the sailor inhales the iodine of the sea. Has it, perchance, any hygienic effect upon brain cell or body cell? Lord Kelvin once imagined that incomers from space brought the first germs of life to the flying earth; is it then permissible to imagine that they may continue to bring something of the unknown power? Who can say to what extent the atmosphere of the earth has been changed by electricity encountered on our way through space?

The dust of the great journey at any rate must accumulate, though usually it is invisibly combined with the substances of the earth. But Nordenskiöld on the vast Greenland snowfields found layers of "cosmic dust" believed to be derived from meteors, and similar dust has been brought up by dredging from the abysmal regions of the oceans, where it forms one of the constituents of the red clay that is characteristic of the deepest floor of the sea, where the motionless water permits its accumulation.

More startling, though far less frequent than shooting stars, are the big, glaring, exploding, and trail-leaving fire-balls, called variously "meteorites,"



Courtesy American Museum of Natural History, New York

THE TELLTALE MARKS OF AN IRON METEORITE



These peculiar crisscross lines of crystalline formation are found only in meteoric iron. They are brought out by polishing a smooth surface of the meteorite and then etching it with dilute sulphuric acid. When subjected to the same process, artificial iron fails to bring out these lines, which are known as Widmanstätten Lines

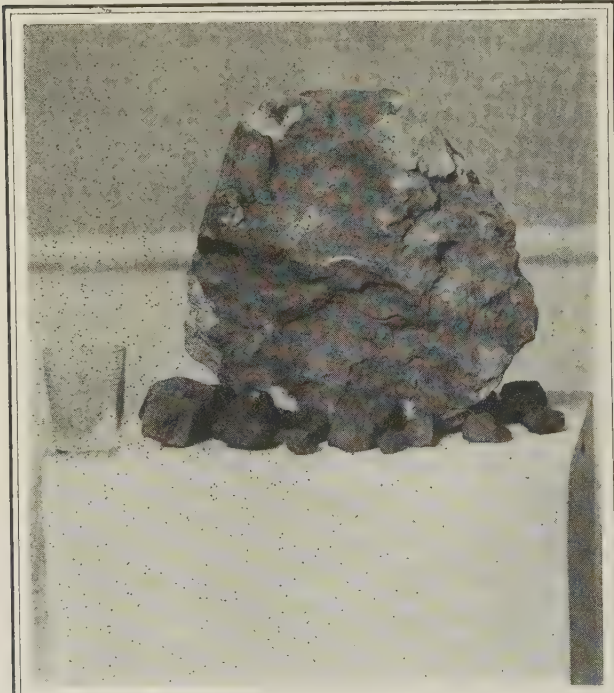
RIDING THROUGH SPACE

“bolides,” “uranoliths,” or “aërolites,” which occasionally come plunging upon the earth as it plows onward through space, and often strike the ground with great force. When they arrive the sensation is as if our little Ship of Space had been steered recklessly into the midst of a battle of celestial dreadnaughts. These missiles sometimes weigh many tons. And their speed, when they strike the upper limits of the atmosphere, is sometimes more than forty miles per second. But the resistance is so great that the speed is rapidly reduced, though still they may travel hundreds, or even thousands, of miles through the air, if the elevation is great; while, on the other hand, some are so much slowed up that at last they drop almost vertically upon the earth under the pull of gravity alone.

It is by such incidents that we are reminded what an effective shield the atmosphere is for the earth. It is better than cotton bales or a steel dome. There are a few apparently trustworthy records of persons being killed by meteorites, but none by mere shooting stars, because the latter cannot reach the ground except in the form of dust. But it is believed that from *fifteen to twenty millions* of these little bodies enter the atmosphere every twenty-four hours, and though they may be on the average no bigger than peas or sand

grains, yet their enormous speed would make them more dreaded than lightning bolts, if, luckily, they were not arrested and consumed before they can get through the air.

The atmosphere is not able to keep the big, heavy meteorites from reaching the ground, but, as we have seen, it rapidly reduces their speed, burns or melts off their surfaces, and, by its resistance, also breaks them to pieces or causes them to burst asunder, in mid-flight, like exploding bombs. The thunder of an exploding meteorite — and several successive explosions sometimes occur—is audible for many miles, and has sometimes been heard over the width of a whole state; and their fragments have been scattered over square miles of



THIS METEORITE WAS SEEN FALLING FROM
THE SKIES

At 5:15 P. M., on May 2, 1892, the inhabitants of northern Iowa were startled by a cannonading noise. On looking skyward, they saw a blinding streak of light moving across the heavens from west to east. Though this happened in broad daylight, the flash was dazzling. It exploded eleven miles northeast of Forest City, Iowa. Fragments were scattered over an area of two miles, and over one thousand were found, of which the above fragment is the largest

territory. The intense heat of their passage through the inflamed air makes them glow with the brilliance of electric suns, and many have been plainly visible in full daylight.

There are mysteries about these objects that challenge solution. They come upon us out of the unknown seas of space, presenting aspects at once so familiar and so strange as to defy classification. They are of two sorts: the iron meteorites and the stone meteorites. The former often are allied with nickel, about in the proportions used for nickel-steel armor plates, as if old Vulcan had prepared them for some stupendous

war in heaven. These are very dense, and many of them weigh tons. In what star were they molded? From the iron bowels of what exploded planet were they shot forth, to wander for ages in space until at last they crossed our track?

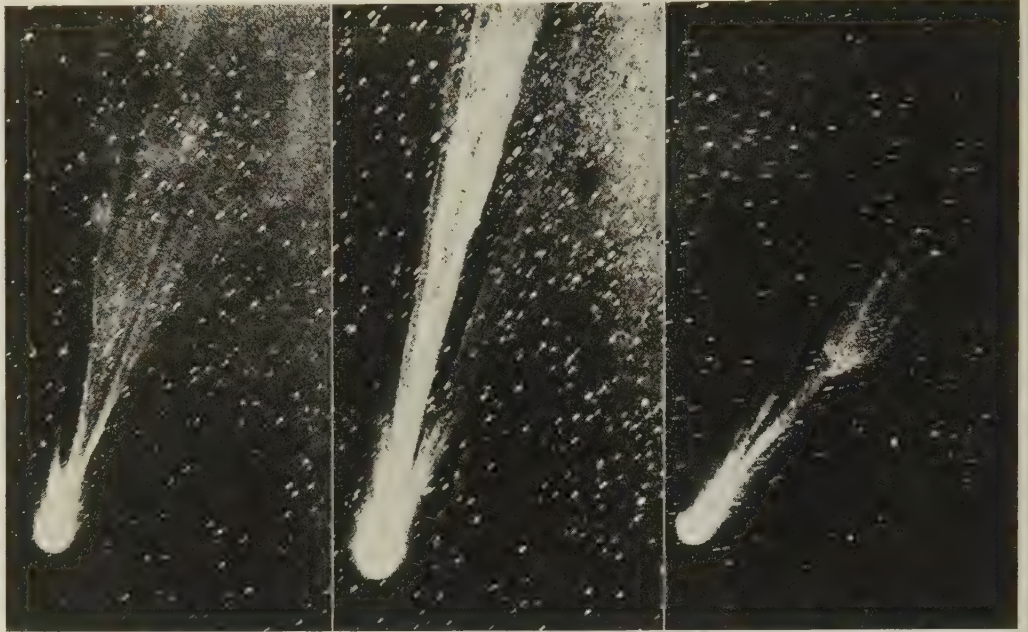
Some of them carry embedded diamonds, not Kohinoors, but numerous little, black, glittering, impish, staring eyelet points, which are true diamonds despite their ebon hue, as they prove by tearing steel saws and emery wheels to pieces as if made of nothing but wood. The monster, perhaps several hundred feet in diameter, that drove a wide crater a thousand feet deep at Coon Butte in Arizona brought thousands of these minute black diamonds, as if in propitiation for its rude blow to the passing earth. So it would appear that diamonds are made in other worlds by dissolving carbon in molten iron, and crystallizing it under the effects of pressure. But one would like to know where these worlds are—or were—and what happened to them. One would also like to know the date when that missile struck North America. It was probably before Columbus' voyage. Some scientists tell us that the iron meteorites were shot out of the sun and other stars.

Then, again, the stone meteorites offer us other puzzles. About one third of the chemical elements known in our laboratories are contained in them, combined into many minerals, some of which are perfectly familiar, while others are not native to the earth. One remembers how Columbus on his



A HUGE METEORITE AT CHANDPUR, INDIA

On April 6, 1885, a great meteorite dashed across the sky, and burst with a roar and spreading streaks of light, just over Chandpur, India. The natives were terror-stricken and ran for cover



THREE PHOTOGRAPHS
OF SWIFT'S COMET ❖

Extraordinary disturbances of the tail can be noticed in these successive photographs, which were taken by Professor Barnard on April 4, 6, and 7, 1892, at Lick Observatory, near San José, California

first voyage picked up in the midst of the ocean branches of strange trees and curiously carved pieces of wood and argued from them the existence of the new world from whose shores they must have come. So we, on our infinitely grander and more mysterious voyage, may, from these examples of the flotsam of space, draw inferences concerning the strange planetary systems from which they have drifted out into the vast lagoon of the Milky Way, across which our course seems to lie.

Not unconnected with the meteor showers are those even more mysterious denizens of the ethereal ocean, the comets. The meeting with a comet is among the most spectacular and thrilling of all our celestial adventures. Astronomical authorities are not in strict accord concerning the place of origin of comets. Some hold that they are, in many cases at least, "wandering masses that pass from star to star, visiting our sun but once;" others maintain that they have all originated in connection with the sun, and are traveling with it, although their orbits are widely different in form, size, and position from those of the planets. But if, as seems to be the case, many of the great new comets that appear from time to time travel in parabolic or hyperbolic orbits, then they cannot be permanent attendants of the sun, and when they go away most of them will never return. But after the lapse of vast intervals of time they may visit other stars as they have visited ours.

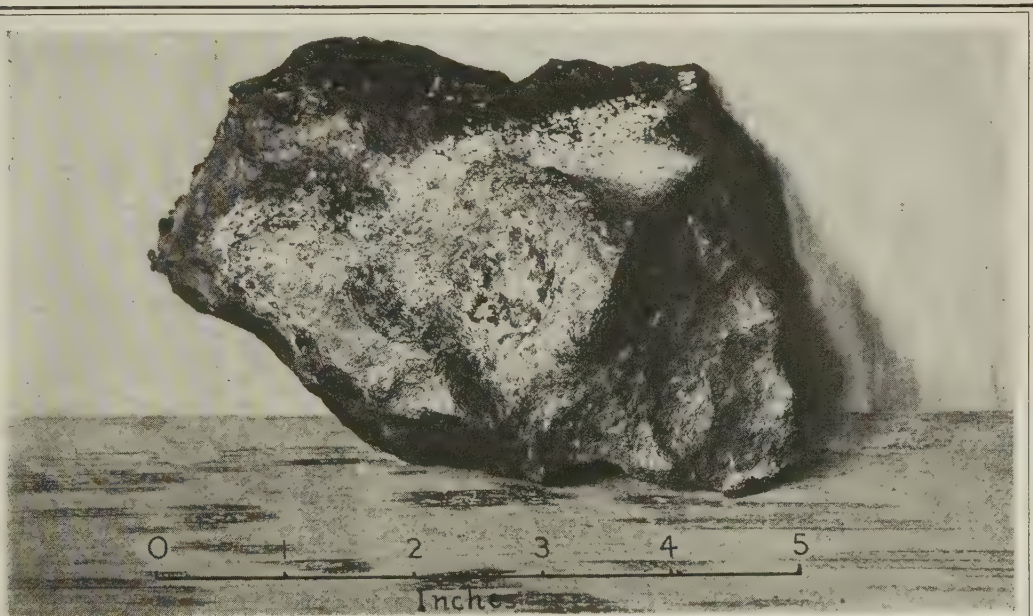
The approach of an unknown comet (that is, one known not to be traveling regularly around the sun, and so not to be regarded as a member of our squad-

ron) is often an exciting sight. It is the astronomers who first discern it afar off with telescopes. It draws slowly nearer, looming larger, until through the glasses a gleaming flick of the tail is caught. Presently all eyes begin to behold it. Its nucleus glares like a fiery optic; its tail becomes a growing menace, brandished over the stars.

As its wings through perihelion—that is, its nearest point to the sun—its speed (if the approach is a close one) becomes hundreds of miles a second. It seems to graze the sun and may be seen blazing, intensely bright, right beside the King of Day at high noon. This has happened several times—in 1843, 1861, 1880, 1882. In such a circumstance what wonder if a strange fear runs over the earth, a dread that an unspeakable disaster may be impending over the threatened flagship of the planetary fleet? Such fears have sometimes been heightened by scientific discussions of the probable effect of the plunging of a large comet into the sun.

Even more exciting is the thought of a direct encounter between a comet and the earth. Comets are believed to be of relatively slight mass and consistency. Their tails certainly consist only of rare gases or infinitesimal particles. Their heads, or nuclei, may contain some solid matter.

A comet *might* hit the earth—there is a bare possibility. The consequences would depend upon the mass of the comet. But at most, judging by what we know so far, the impact of no comet could produce more than a local disaster. The earth as a whole would be safe. Maybe it was a comet that made that



A METEORITE
FROM THE YERKES
OBSERVATORY
COLLECTION ❖

Meteorites are usually classed into three groups which are more or less interrelated. The first class consists of *siderites*, which have iron and nickel in their composition; only nine of this class have been seen to fall. The second class, called *siderolites*, are composed of iron and a large proportion of stony matter; these are comparatively scarce. The third class, *aërolites*, consists entirely of stony matter, and are the most common



crater hole in Arizona; nobody can say positively that it wasn't. Maybe meteorites are small comets that have run into the earth; again, all depends upon theory and the point of view, and nobody can be sure. But that about which there is no doubt whatever is that these things exist and these happenings occur.

In one form the dreaded accident has actually happened more than once—namely, as an encounter between the earth and a comet's tail. A notable instance was that of the comet of 1861. That comet swung between the sun and the earth as they sailed on, and its tail, more than a hundred million miles in length, swept over the earth on Sunday, June 30th. The only phenomena that could be connected with this occurrence were peculiar appearances in the atmosphere, such as a strange yellowish look to the sky in the afternoon and a faint phosphorescence in the heavens during the evening. In like manner a part of the tail of Halley's comet passed over

the earth in 1910, and apparently the tail was "torn" by the encounter—at least so photographs seemed to tell—although the consequences to the earth were nothing.

Visibly the comets go to pieces. This happened very dramatically to the celebrated "lost comet" of Biela, which in 1846 split into two comets, the halves receding from one another some hundreds of thousands of miles as they retreated from the sun. But in 1852 back they came, side by side, but now separated between one and two million miles, and thus, like racers, they disappeared again in the distance and were never seen again, unless it be true, as some astronomers believe, that the Andromede meteors periodically appearing late in November are their scattered débris. All the regular meteor swarms are believed to be the remains of disintegrated comets.

Far more imposing to the imagination, though less definite in known details, are the adventures that the earth not improbably has experienced, and may again experience, in consequence of the differences in constitution of the various regions of space across which the path of the solar system lies. Harlow Shapley, director of the Harvard Observatory, has called attention to the fact that the solar system would appear, some millions of years ago, to

RIDING THROUGH SPACE

have passed through the nebulous region of Orion, where vast glowing clouds are intermingled with strange dark nebulosities. At its present speed the system may have been involved for a million years among those bright and dark nebulae, and it is conceivable that the effects upon the sun's radiation might account for periods of heat, cold, dessication, and glaciation in the geological history of the earth.

It is known that many of the dark nebulae are relatively near us—not absolutely near—and it is not unreasonable to suppose the possibility of

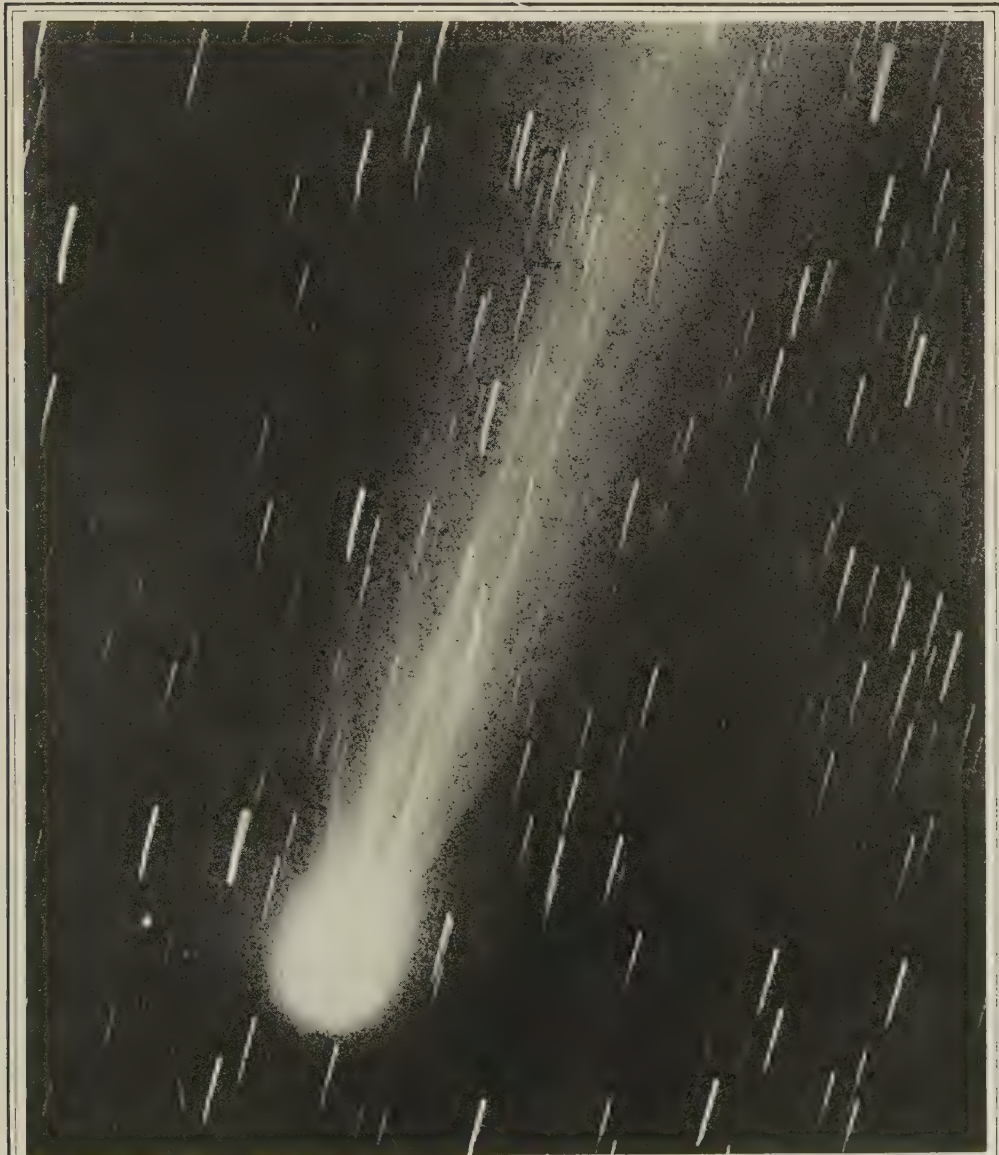
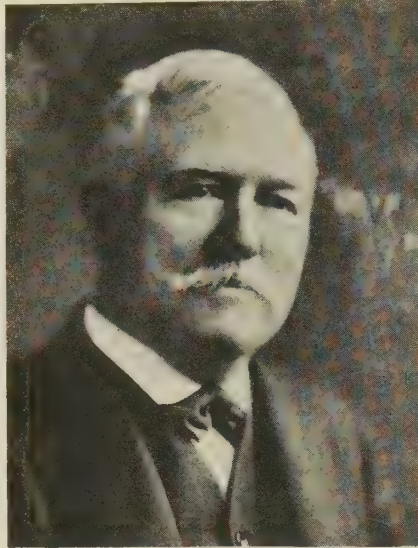


Photo Brown Bros.

A NATURAL ❖
"SKYROCKET"

A photograph of Daniel's comet taken July 17, 1907, showing the beautiful fan-shaped tail. The white streaks parallel to the direction of the comet's motion represent stars, as the camera was made to follow the comet and not that of the stars



Courtesy Yerkes Observatory

THE MASTER PHOTOGRAPHER OF THE HEAVENS

Professor E. E. Barnard's astronomical discoveries are numerous; they include sixteen comets, the Fifth Satellite of Jupiter, and many nebulae. He was the pioneer in showing the structure of the Milky Way with its extended nebulae. He was born in 1857 and died in February, 1923.

future passages of the flying solar system through regions where meteors and meteorites will be encountered in vastly increased numbers, or where its course will lie through the midst of nebulous clouds that may produce not only great changes of temperature, but also great alterations in the composition of the earth's atmosphere, with consequences to its living inhabitants that can at present be the subject only of conjecture. The sun may sometime run us into a dust cloud so thick or a dark body so solid and massive that there will be a wicked flash, seen trillions of miles through the night of space, and after that no more days and nights succeeding one another on a little tempered globe of lands, oceans, winds, and clouds, but only the angry glare of a nova amidst the millions of tranquil stars.

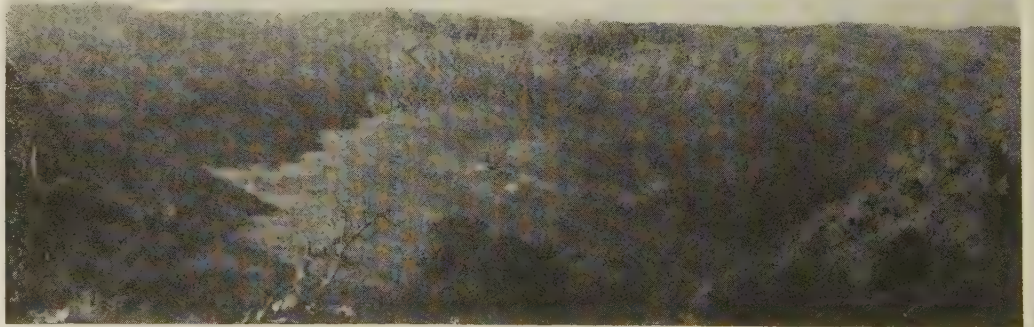


Photo American Museum of Natural History

WHAT HAPPENED WHEN A GIGANTIC METEOR STRUCK THE EARTH

A crater, a mile wide, dug out centuries ago in the bed of Diablo Canyon in Arizona. The bottom is about five hundred feet below the level of the surrounding plain, while the walls of the crater rise from sixty to two hundred feet above the plain.

BERMUDA WAYS AND BYWAYS

GLIMPSES OF LIFE AND SCENERY IN THE ISLANDS
PHOTOGRAPHED ESPECIALLY FOR THIS NUMBER BY
SHERRILL SCHELL—ACCOMPANIED BY DESCRIPTIVE
TEXT BY THE EDITOR OF THE MENTOR



ARRIVAL AT THE HAMILTON DOCK

At the moment of arrival a chapter of new and strange things opens for the visitor. Before him is a white dock crowded with black people, eager and curious. Under corrugated iron roofing stand the revenue officers at their booths; and back of the dock a queer old town of picturesque buildings, all white except the great cathedral, which, with its pink roof and towering height, dominates Hamilton and all the western part of the island

THE "Remote Bermudas" means many things to many people: a convenient way-station on the southern sea routes, and a place of refuge for distressed mariners; a goal for those that sail the sea for sport; a pleasure resort for those that crave the outdoor life; a fairyland for idlers; and a resting place of fair skies, soft winds, sunshine, and flowers for the tired and nerve-worn, and for fugitives from frost. ❀ ❀ ❀

BERMUDA WAYS AND BYWAYS

Floating islands they seem to be as we zigzag along the north shore and thread our way through the narrow channel maze that leads into the dock at Hamilton.

The imprint of time is the first impression that we get as we gaze at the rolling hills dotted with white houses. It is a long reach of years from the ocean loneliness that Juan Bermudez found when he sighted the islands in 1515 to the present-day Bermuda with its busy little city of Hamilton on the west harbor and the quaint old town of St. George's on the east; with the quiet villages, the picturesque cottages nestling in the green, the white roadways and many-colored waterways, and the general condition of quiet and rest that whispers of peaceful human dwelling through many generations.

Upon this background of centuries-old settlement we find imposed the modern conditions of a popular resort: hotels, large and small, and country clubs; with yachting, bathing, bicycling, tennis, and golf. Automobiling is forbidden — and thank heaven for the glad relief! A year or so of dust-raising speed would tear those narrow limestone roads to pieces and wrack nerves that are enjoying a rest to be found in only a few inhabited spots on earth.

The popular saying is that there are 365 islands — one for every day of the year — and that may be so at low tide. Actually, however, there are about 150.

I wonder how many of those that play golf or tennis, that ride their wheels or dance at the hotels, realize that they are riding, putting, playing tennis, and one-stepping on the



A BERMUDIAN FRUIT VENDER

There is a little colony of negroes from the West Indies in Bermuda, many of whom live in Hamilton, where they sell fruit. The women are mostly to be found on Front Street sitting in the shade of some shed or shop with large baskets of fruit in front of them



A VIEW OF HAMILTON FROM THE BAY

The dominating features are the cathedral and the towers of the Sessions House, which rise high above the dazzling white roofs of the business buildings and dwellings. In the Sessions House sits the Supreme Court and also the Bermuda Assembly



FRONT STREET, HAMILTON, BERMUDA

Front Street faces the harbor and is a busy street, especially on steamer day, when it is filled with people of many nationalities, white and black; baggage and cargo of all kinds; and carriages and bicycles. In the full length of Front Street there is a shop for almost every human demand

top points of an oceanic mountain 15,000 feet high?

Thousands of years ago a great volcanic boil burst up through the ocean down Bermuda way. When that disturbance was over, coral insects gave service for thousands of years more. Then came sand, washed up by the sea and piled up by the winds, and seed carried by birds and ocean currents; after that came vegetation that made the islands green; and finally came man.

It's a long story from geology to golf, from coral insects to cottage dwellers, from the bivalve to the bicycle, from high-sea pirates to hotel piazzas—but it has all come in time, and time with a capital T works wonders. At first a place to be shunned as a haunt of evil spirits, the islands are now a pleasure resort for the tired business man and his lovely daughters—and a resting spot for anyone that seeks peace and quiet. Bermuda is generally called a winter resort, but, like southern California, it is enjoyable the year round, and is at its best in the spring. In January and February it offers relief from the snow and chilling blasts of the north, but it is in the months of April, May, and early

June that the islands are most inviting, for it is then that the full glory of foliage and flower unfolds itself. It is then that the oleander, hibiscus, morning glory, bougainvillea, and English heath glow on the lawns and along the white roads, and the royal poinciana is in full bloom.

The cedars, palmettos, palms, mangrove, calabash, mulberry, and Pride of India trees are at their freshest then—and, hemming in the fields, we find everywhere the impenetrable hedge of "match-me-if-you-can," its leaves a rich magenta underneath and green in the palm, softened by the lime dust of the road to a smoky tinge. The bush gets its name from the fact that one can never find two leaves that match each other exactly.

A strange tree is the fiddlewood, which colors and drops its leaves in the spring! In Paynter's Vale, late in May, you will see all the glories of autumn foliage—yellow, red, and brown. And there, too, you will see the original fiddlewood tree from which the others sprang—a venerable old patriarch. You will be told that the fiddlewood tree was brought from Australia, and that autumn there is our spring, so that the fiddlewood

tree keeps its habit and lets fall its leaves in June. It is a pretty story—too pretty for the botanists to spoil, so, if you like the story, don't go to the botanists, but rest on W. D. Howell's statement that in Bermuda "there is no fall or spring; the trees simply drop their leaves when they are tired of keeping them on, and put out others when they feel like it."

There is so much to see in Bermuda that a short trip merely opens one's eyes. The islands are only about twenty square miles in territory, but no wizard in the old days of enchantment could have constructed a more wonderful show-place of natural curiosities. Carriages and boats will take you anywhere you want to go—and if you keep going for a number of days you can learn something about Bermuda. If you are of an independent nature, get a bicycle, go your own way, and ask questions. And whether you ride a bicycle or drive, remember the rule of the road: pass others on the *left* side, English fashion, instead of on the right, our fashion. Even the dogs in Bermuda pass each other on the left.

You can go in launch and glass-bottomed boats to the sea gardens, where you will find submarine scenery and fish-life that you will never forget. You can ride to Gibbs' Lighthouse for a general view of the islands and waterways. From an airplane you can take in all Bermuda at a glance. Below you the islands will seem like a delicate stretch of lacework spread upon the surface of the sea. A long ride west takes you to Somerset, where you can see the Cathedral Rocks and then go on to the dockyards. But the most interesting ride of all is the full day's trip to St. George's and back. Ride through the

Agricultural Experimental Station on out to the Devil's Hole—a natural aquarium filled with amazingly queer fish of many kinds and colors—then to Tucker's Town and the Crystal Cave. After that, a run across the long causeway that divides the north waters from Castle Harbor leads you into old St.

George's, the original settlement in 1612 and the capital of Bermuda up until 1815, when the government headquarters were transferred to Hamilton. Returning by the north shore you get a different aspect of land and sea, with the ocean beating almost at your feet. You ride through the neat little village of the Flatts, then along the north coast road to the Government House property, and finally down Langton Hill to Hamilton.

Besides these day trips, there are many enchanting rides for a morning or afternoon: to Elba Beach, to Spanish Point, to Fairyland, and to the various caves—the Crystal Cave being the most notable in character and beauty. It was

there that Annette Kellermann played a daring mermaid scene for her film picture "Neptune's Daughter." Farther along the road you meet a sign that reveals the fine hand of the enterprising showman. It reads "Prospero's Cave, Scene of Shakespeare's play 'The Tempest.'" Shakespeare undoubtedly knew something of Bermuda from various mariners' reports of it, but even if he had the islands in mind in writing the play—which is doubtful—he certainly selected no definite cave there as the retreat of Prospero and Miranda.

Another title in that part of the island invites comment. The picturesque little villa at Walsingham, bearing the date 1652, is called "Tom Moore's Cottage," implying



A BERMUDA POSTMAN DELIVERING MAIL

One of the queer little byways of old St. George's. In the collection and distribution of mail the postman of Bermuda pursues tortuous and picturesque paths in St. George's—up- and down-stairs, around sharp corners, into queer nooks, through strange narrow covered ways, and over rocks to isolated cottages. A postman's route stops short only of climbing trees

that the Irish poet lived there, when, as a matter of fact, he held an official position in St. George's for about three months in 1804, and only at times visited Walsingham. The fair "Nea" who caught his vagrant fancy, and to whom he addressed ardent attentions and sentimental verse, lived at St. George's. Her home, in a tumbled-down condition, may be seen there to-day.

St. George's is a quaint and curious old town—white streets, white houses enclosed in white walls, and a number of narrow little white alleyways with queer names: "Shin-bone Alley," "Tin Can Alley," "Old Maid's Alley," and "Featherbed Alley." Every corner holds a surprise, and every surprise gives one a lovely picture. The most interesting of all structures in this picturesque old town is St. Peter's Church, first built in 1612, only two years after the death of the Bermuda Colony founder, Sir George Somers, whose heart is buried under a memorial that stands by the little park that bears his name. Going and coming from St. George's we note the barrenness of the hills on the oceanside as

contrasted with the rich verdure of other parts of the islands. I remarked to our faithful driver that it must be windy there in winter time. "Yes," he answered, "them hills is *werry draughty* in winter—*werry draughty*."

The waters, everywhere colorful around Bermuda, display a magical spread of tints on both sides of the long causeway. In the shallows, waves of gleaming topaz lap the sand; beyond is pale green, then turquoise, deepening into indigo-blue, with under-spots of seal-brown and purple where the coral reefs show through the water. The colors fool the senses; it seems as if bathers must be stained by the waves.

An interested little old lady told our driver that she wanted to take some of the beautiful waters home. "I want three bottles full," she said, "one of that dark blue, way out there, one of the turquoise nearer in, and one of the light yellow just below us."

The sand of the shores has its beauty, too. Unlike the coarser grain of American sea sand, it is as fine and soft as wheaten flour,



GOVERNMENT HOUSE, BERMUDA

The Government House is situated on the hill above Hamilton, and is the official residence of the Governor of Bermuda. It is an imposing building of Italian style, and is surrounded by beautiful gardens containing many rare specimens of tropical plants. So many liberties were taken with the flowers and plants that the grounds are no longer open to the public, and can only be visited by special permission

and light pink in color, due to the mixture of powdered coral. That, at least, is a color that visitors can take home, and many do.

In Bermuda there is good bathing everywhere. Besides the many fine beaches, like Elba on the south shore, the coast line holds a succession of little bays and coves where people may picnic and then plunge into the green and purple water.

Wondrous water everywhere for bathing—but drinking water is another matter. Though Bermuda is called a “Land of Sunshine,” it is absolutely dependent on rain. That is the reason why the roofs of the houses are pure lime-white. Every surface that can collect rain is carefully guarded. On the hills we see great white sloping basins of cement.

They are called “water catches,” and they gather the harvests of rain into cool, dark cisterns, where they are stored for future need, as the grain of Egypt in ancient days was garnered against a time of famine. Every house has its cistern, and hotels and country clubs maintain huge water catches, for a drought of three months in Bermuda would be a serious thing. A full cistern then would be better than money in the bank.

There are birds and flowers enough in Bermuda to fill books, and many of them are readily recognizable. Sparrows and catbirds are everywhere, and our cheery friend bobwhite. The birds of beauty that quickly catch the eye are the bluebird and the crested cardinal. They flash across the path wherever we ride, and we hear almost constantly the endearing call “Cherie! Cherie! Cherie!” The birds need fear no snakes. Bermuda is a Garden of Eden *without the serpent*. They say that there is not a single snake in the islands.

Skirting the lanes and lawns we see our familiar home flowers: roses, geraniums, nasturtiums, and the honeysuckle. Many of the birds and flowers, as also the trees, have been brought to the islands. Where flowers have been cultivated and kept within bounds, they have grown “true to type.” There are, however, a number of interesting “escapes,” where flower seed has blown away and become a wild child of nature. In Somerset I saw a *green rose* in bloom.

The trees are amazingly numerous and strong, considering that they have only a few feet of soil to hold on to. They clasp the limestone where the soil stops, and they trail their roots anywhere to get a firmer grip.

The soft limestone means a great deal to mankind in Bermuda. As W. D. Howells has put it, all one has to do is “to saw a hole in his land, take out a house of soft, creamy stone and set it up, and go to living in it.” A man simply turns the contents of his cellar into the material for his home. And many of them are beautiful homes. The old houses are ranch-like—only a story and a half or two stories high and square—but there are also many new and fine examples of architectural building. The most ambitious enterprise in home and country-club building is to be seen in the Tucker’s Town district, where the luxurious Mid-Ocean Club House has just been completed. There we



INDIA-RUBBER TREE, HAMILTON, BERMUDA

This india-rubber tree may be seen on Queen Street, Hamilton, where it stands in the grounds in front of the Bermuda Public Library. It is a particularly fine specimen—forty-five feet high and with an expanse of over seventy feet

find an exclusive restricted property of great extent on which fine cottages are being built, and where a well-constructed golf course has been laid out by Mr. C. B. Macdonald, the American golf enthusiast. There are five or six golf courses on the islands, but the two that command the consideration of the class golfer are the Riddle Bay golf links in



FAIRYLAND, BERMUDA

The Fairyland section of Bermuda is about an hour's walk west from Hamilton, and is most picturesque. The shore line is cut in saw-tooth fashion, so that one comes upon many little coves and inlets. A ramble through the footpaths or along the water's edge affords ever-changing vistas of sky and sea

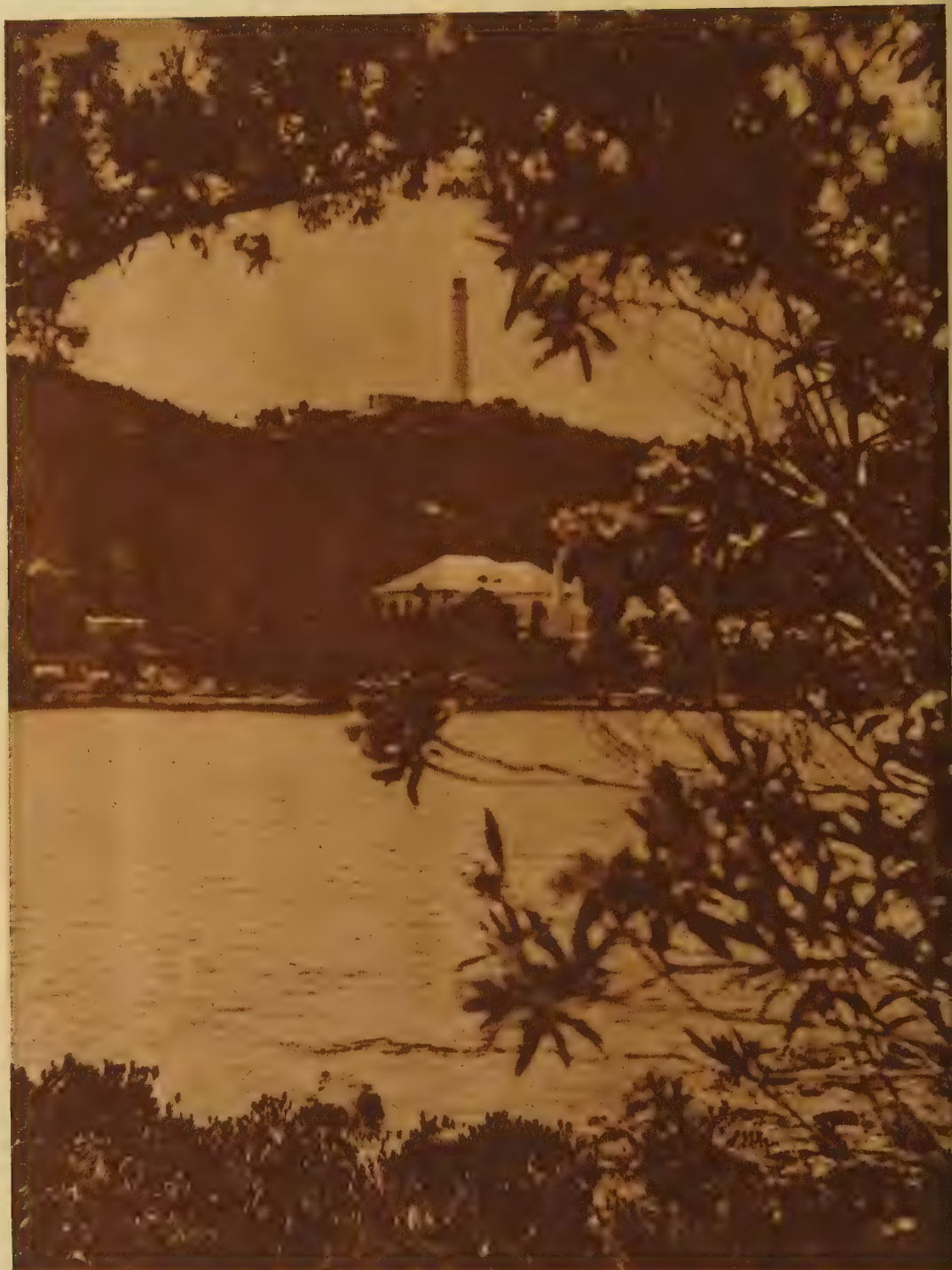
the eastern part of the islands, and the Mid-Ocean.

The shallow soil is rich, and man cultivates it profitably. But where there is only three feet of soil, how does he bury his dead? The graveyards are filled with generations of departed Bermudians, and monuments mark their graves. How can they find six feet of soil? They don't. The graves are cut down *into the white limestone*, and a plate is placed there. On the surface, a monument or slab bears the name or names. Surely no mortal could ask for a finer resting place—in clean white stone on the summit of an ocean mountain!

The native inhabitants of Bermuda have lived there for many generations. Every-

where on the islands we hear the names of old-time families repeated, and we can trace some names back for two centuries. It is a quiet life they lead, and many of them prefer it so. Those that want it can have plenty of social activity, for there are many brilliant functions—the military and naval establishments there assure that. But, for the most part, a tranquil spirit pervades all their living affairs.

A restful garden spot—that group of islands way out there in the Atlantic; “the tidiest country in the world,” as Mark Twain said. The deep peace of the place “sinks into one's body and bones, and chloroforms the legion of invisible small devils that are always trying to whitewash one's hair.”



GIBBS' HILL LIGHTHOUSE

Gazing up through the oleander bushes by the side of Jew's Bay, one gets a fine impression of the height and imposing character of Gibbs' Hill Lighthouse. The lighthouse is situated on the highest elevation along the south coast of Bermuda, and consists of a steel column ninety feet high. The building of the lighthouse was completed in 1846, and lamps were lighted on the first of May of that year. The new light, installed in 1904, is one of the most powerful in the world, giving an illuminating power of nearly one hundred thousand candles, which makes it visible twenty-seven miles away in clear weather.



VIEW FROM GIBBS' HILL LIGHTHOUSE

The finest view in Bermuda may be had from the top of Gibbs' Hill Lighthouse. On the east one can see as far as St. George's, on the west and north the eye travels around the curving panorama of Somerset to Watford, Boaz, and Ireland Islands, tipped with the white buildings of the dockyard and the Commissioner's House. Just in front and far below lie islands of varied sizes, scattered over the surface of Great Sound; and in the distance straight across may be seen the shore of Pembroke, with cottage settlements outlying the town of Hamilton.



ONE OF BERMUDA'S BEAUTIFUL ROADS

Bermuda roads are a joy to the men that ride a horse or bicycle, and this is one of the most attractive bits in the island. It leads one from the north shore road, by shady winding route, down into Hamilton. Just back of the bicyclist may be seen the wall that skirts the north shore road, and beyond that the blue expanse of the ocean stretching north for thousands of miles



© Ewing Galloway, N. Y.

BANANAS ARE PLENTIFUL IN BERMUDA

The name of Bermuda means to most folks potatoes, onions, and Easter lilies, but bananas are plentiful, and so are melons. The soil is rich and fertile, and yields bountiful crops of the vegetables that we know as staple—tomatoes, potatoes, cabbages, and beans, and also fruits of a kind little known to us—mangoes, papaws, citrons, figs, and alligator pears. On the right of the road in the picture above we get a view of a well-kept vegetable and fruit farm, enclosed in a hedge of "match-me-if-you-can"



© Ewing Galloway, N. Y.

THE WAY NATURE BUILDS IN BERMUDA

In Somerset, at the extreme end of Gibbs' Point, stand the remarkable Cathedral Rocks, carved and worn by the sea into columns and arches resembling a ruined ancient temple



THE WAY MAN BUILDS IN BERMUDA

The materials for a man's house in Bermuda are to be found in the ground that he buys. He chisels and saws out cubes of creamy-white limestone, places them one upon the other as children would build a house of blocks; then binds them with cement, whitewashes them, and makes his home inside. The limestone would be too soft to stand a more rigorous climate than Bermuda, but it seems to harden there on exposure to the air, for many of the houses have stood the test of two centuries and appear as solid to-day as when they were put together



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KHYBER PASS—A "ONE-WAY ROAD" IN BERMUDA

There are many roadway cuts through the hills of Bermuda, but none that equals in depth and narrowness the famous Khyber Pass in Warwick Parish, where it runs from just opposite old Warwick Church through to the south shore road. It is perhaps unique among the world's roads. Once in, with carriage and team, you go through to the end; you cannot turn around and you cannot tip over—safe enough, for it is a straight and narrow path with high walls



WALSINGHAM HOUSE—CALLED THE "TOM MOORE COTTAGE"

Tom Moore, the Irish poet, lived in St. George's for a few months in 1804 when he filled the post of Registrar of the Court of Vice-Admiralty. He visited Walsingham House, which was located on Castle Harbor, about four miles distant from St. George's. Though called the "Tom Moore Cottage," it was the home of the Trott family. Near by, in the woods, may be seen the calabash tree which Tom Moore's pen celebrated in verse. Although, as Joyce Kilmer wrote, "only God can make a tree," a poet can make a tree famous



A GLIMPSE OF ST. GEORGE'S, BERMUDA, FROM THE HILL

St. George's, the former capital of Bermuda, is seen to best advantage from the hills that almost encircle it and over which it climbs. The houses nestling among the tropic foliage, and the blue bay beyond, with its anchored ships and its skimming sailboats, make an enchanting picture. St. George's antedates Hamilton by two centuries, and it still preserves the quaint aspect and peaceful atmosphere of some Old World town



A QUEER NOOK IN ST. GEORGE'S

The old town is full of just such unusual scenes as this. No one can guess what he will find "just around the corner," but, whatever it is, he may be sure it will be picturesque and interesting. In front we see the tower of St. Peter's, the mother church of Bermuda. On the site of St. Peter's stood the oldest Anglo-Saxon church in the Western Hemisphere—the original structure was built when the first settlement was founded by Sir George Somers in 1612. Two structures have replaced the original, and they gave way to the present building, which was erected in 1713 and added to in 1765 and 1860.



A GATEWAY IN OLD ST. GEORGE'S

A glimpse down one of the extraordinary little picture-streets of the quaint old town. The figure in front is a typical native Bermudian negro child



THE AMERICAN CLOCK FATHERS

BY MRS. W. L. HARRIS

The measurement of time is a story of increasing interest from the days of the first couple, whose fateful romance ended in the establishment of a working day, down to the present, when we time the heavenly bodies with scientific accuracy.

To Adam's descendants the sun's shadow suggested the sundial. Then the hourglass was invented.

The first timepiece operated by dial, wheels, and hands is recorded as having been made in the year 510 A. D. Rude clocks were installed in monasteries in the twelfth century, and William, Abbot of Hirschau, is credited with being the inventor of clocks as we conceive them.

Subsequent clock progress is so intertwined in the various nations that the development is similar. In 1286, London's first clock was erected in the tower of St. Paul's Church.

After the year 1600 clocks became so plentiful in England that the sluggard had not much excuse. Changes in the pendulum resulted in the long case. The table clock was the forerunner of the "personal clock," later known as the watch, because first provided for the use of watchmen.

These various clocks overflowed into the Colonies. The long case became a fixture. The inheriting generation treasured these clocks as members of the family; consequently they became known as "grandfather" clocks.

Clockmakers crossed the Atlantic about 1650, but their names and the clocks they made are forgotten. One of the earliest clocks made in this country is still in its home town, Charleston, South Carolina. On its dial is

the inscription, "William Lee, Charles Town," with the date, 1717, on a large metal plaque above the dial.

New England was first famed for steeple clocks. The New England conscience memorialized itself by demanding two years' usage as a fair trial before payment. The tower clock in the Old North Church in Boston was made in 1726, and is especially well known because Paul Revere's lantern of historic fame was hung in the same tower.

Massachusetts and Connecticut became the clock manufacturing centers. Terry belonged to Connecticut, Willard to Massachusetts. There was a whole family of Terrys; there was a whole family of Willards. The best we can do is to bestow on the two men the title of the American Clock Fathers. Many of the other well-known makers had at some time been apprentices or partners of Terry or Willard.

The English ship that brought the tea for the Boston Tea Party in 1773 performed another service of importance to America, for she had as a passenger one Thomas Harland. This man's fame as a clockmaker must have preceded him, for apprentices from all the Colonies flocked to him at once. During the first twenty-five years of this period, while the Willards were prominent in Massachusetts, there sprang up in Connecticut, under Harland's tutelage, a group of remarkable clockmakers. Eli Terry overshadowed

the group. He made the Harland clock when he began business for himself. It was the custom in New England to do all the laborious hand work in the winter, and to peddle the clocks up and down the countryside in the summer time. Frequently only the works would be taken and sold, journeymen carpenters making the case. This resulted in the American "Wag." Dust and dampness usually ruined the works before the case was



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THE ANCESTOR OF THE AMERICAN CLOCK

The "half clock" or "shelf clock," made in 1814 by Eli Terry, revolutionized the clock-making industry in this country. All other forms became obsolete, the "long case," or "grandfather," clock being revived only after many years. The original example of the shelf clock is still ticking off the hours in the old home of the Terry family in Connecticut. Note the Arabic numerals, the pierced hands, and the exquisitely carved case with pineapple decoration signifying welcome.

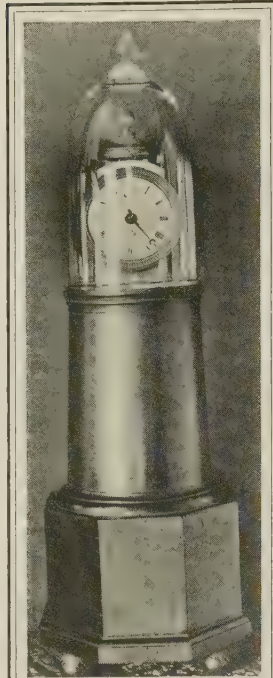
THE MENTOR

made, so few authentic wags remain, although thousands were made.

Terry made his first wooden works at twenty years of age, working practically alone, using a hand engine in addition to jack knife and jig saw. He began four at a time, then a dozen, but dismal failure was predicted when he undertook to make five hundred. Instead, the five hundred must have been the turning point, for in 1807 he had an order for four thousand! The order was completed in three years and inaugurated an era of wooden works which lasted for twenty-five years. Terry now had partners and apprentices. Seth Thomas and Silas Hoadley were joiners for him about this time. In 1820, owing to modern sheet metal and machinery coming into general use, there was a return to clock works made of brass.



MOVEMENT AND
PENDULUM WEIGHT
Of a Simon Willard clock



© Harris & Ewing

A SIMON WILLARD CLOCK

Designed to resemble the
Eddystone Lighthouse.
Made in 1780 for Everet
Liphlet of Roxbury, Massa-
chusetts, it has never been
allowed to run down

Terry's great achievement was the making of the "half clock," or shelf clock, in 1814. To the uninitiated, this conveys little meaning, but for the clockmaker of that day it necessitated a new understanding of the principles of balance and gravitation as used in their work. This shelf clock laid the foundations for the clock industry in America.

Terry's first shelf clock is still in good working

synonymous with the name Willard. Father, sons, grandsons, and cousins, with Simon Willard as chief of all. The father, Benjamin Willard, was an early clockmaker at Grafton. In 1780 he was firmly established at Roxbury, in the little home and shop combined where for sixty years his apprentices, casemakers, and workmen of every description gathered, and where he raised his eleven children.

Willard's steeple and hall clocks, as

shape, and is shown to visitors in the old home in what was then Plymouth Hollow, but is now Terryville, Connecticut. Sons and grandsons kept the works up for many years.

In writing of the Connecticut makers, the pioneer in returning to the use of brass works was Chauncey Jerome, who as a youth had made many beautiful cases for Terry. Of this group of Connecticut makers the names of Thomas and Ingraham are still of great prominence. After apprenticeship to Terry, Seth Thomas and Silas Hoadley began as partners at Plymouth. The little town is now Thomaston and the seat to-day of one of the leading clock establishments of the world. Elias Ingraham's plant is still "carrying on" at Bristol.

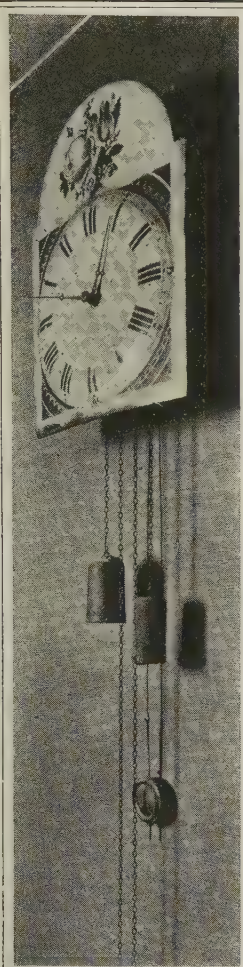
Clockmaking in Massachusetts from 1750 on is a highly concentrated story, practically



© Harris & Ewing

AARON WILLARD BANJO TIMEPIECE

Showing Mt. Vernon in
lower door



© Harris & Ewing

A "WAG-ON-THE-WALL" CLOCK

This quaint "Wag" with rough weights and long chains was made in the Black Forest. Others came from Holland

he termed the long case, made him known to fame. The meeting houses and town halls of New England kept him busy. As a rule, he inscribed "Simon Willard, Roxbury" or "S. Willard, Roxbury" in a running hand on the dial, occasionally using old English script. The collector is warned to make sure of these marks, for Simon's kind heart permitted his favorite apprentices to use the name of Willard, but to be followed by "Boston" instead of "Roxbury."

In Simon Willard's day clock-making was all hand work, and all the work that bore his name was expert work. His "clock papers," as he termed them, originating with the need for directions, were pasted in the backs of many of his clocks. At the age of ninety-five, in 1848, his farewell

performance is as perfect as on the day of the Clock Father's final test. Aaron Willard's son carried on his father's great business for some years, but later turned his attention to astronomical clocks, horology, and the broader aspects of time measurement.

The specialty of the brother Benjamin was musical clocks. These were quite fashionable. He advertised "A new tune every day of the week, and on Sunday a psalm tune." Many of the other brothers made clocks, good clocks and better clocks, but Simon made the best.

The Massachusetts "clock patterns" were either not patented or the patents not protected. Each maker copied what he wanted, and changed the rest to suit his personal preferences. In selecting designs for his

glass doors, Aaron Willard indulged his pictorial leaning—quaint, many-pillared meeting houses, piercing steeples, scenes at Mount Vernon. The War of 1812 supplied popular patriotic designs, including the naval battles of Lake Erie and of Lake Champlain.

The latter half of the nineteenth century witnessed the perfecting of the methods of tempering steel (one of the Willard boys and one of the Terry boys were responsible), and this process inaugurated a new era of clock-making. Extensive factories were built, and the modern Yankee clock was born, which to-day ticks energetically the wide world over.



Courtesy the owner

THE "WILLIAM LEE CLOCK"

Made in America in 1717, it boasts a beautifully carved case and works that give time, calendar, tide, and moon phases

to life was characteristic: "The old clock has run down."

Of all his "clock patterns," Simon Willard is most widely known by his "banjo clock." The patent was taken out on the advice of President Jefferson, who foresaw its continued popularity.

The making of the great clock for the Senate Chamber, his first government commission, initialed the firm friendship between Willard and his President. The attention of Washington sight-seers is always called to the Willard clock in Statuary Hall, in the Capitol. The works were made when Willard was eighty-five years of age, and their per-



FRANKLIN DISCOVERED MANY THINGS WE CALL MODERN

BY RENÉ BACHE

Great-great-grandson of Benjamin Franklin

It was just two hundred years ago—on a Sunday in October, 1723—that Benjamin Franklin, a boy of seventeen, first arrived in Philadelphia. He landed at the Market Street wharf, at about eight o'clock in the morning, dirty and tired, having helped during the night to row a boat that brought him down the river from Burlington. In his pocket he had a Dutch dollar and a few coppers.

Thus did young Franklin begin his career of broad and varied achievement. He was most remarkable as an inventor. His kite-flying experiment was beyond question the most spectacular "stunt" ever accomplished by a human being. It proved the fact, until then not established, that lightning was an electrical phenomenon. Franklin's invention of the lightning rod was at first regarded as a "crank" idea. In England the Royal Society treated it with derision. So much fun was made of it that the philosopher, when he undertook to "bring down the lightning from the skies" with his kite, kept the contemplated experiment a secret, lest he invite more ridicule.

The experiment was undeniably dangerous. An imitator who attempted to repeat it soon afterward was killed. But the manner of its performance is commonly misunderstood. Pictures invariably represent the philosopher as flying his kite in the open. If he had done that, he would certainly have lost his life. The fact is that after raising it into the air he sought safety beneath a shed while the thunderstorm approached, and tied to the end of the string a long silk ribbon. The silk ribbon was a non-conductor so long as it was dry, and protection by a roof

was necessary to prevent it from getting wet.

The experiment was performed on a day in June, 1752. A thunder-gust was coming from the west. The kite was high in the air. The storm clouds, angry and heavy with rain, passed overhead; the rain began to fall. But

there was no sign of electricity, and Franklin felt great disappointment. A few minutes later, however, he saw the loose fibers of the hempen string erect themselves; the string, now wet, had become a conductor. He

put a knuckle to the key, and drew from it a spark!

Eureka! He had proved the proposition. Lightning was electricity. At a stroke he had made one of the greatest discoveries in all the realm of physics. He charged a Leyden jar with the celestial electricity, which exhibited all the phenomena displayed by the electricity already known and familiar.

Contrary to the generally accepted notion, Franklin's invention of the lightning rod preceded his kite-flying experiment.

Experiments in his own house suggested the idea to Franklin that a cloud, consisting of a vast acreage of electrified particles of moisture, might very well be able to deliver to the earth a great discharge of electricity across a wide atmospheric interval. If so, then safety for a building might be obtained by substituting for the needle of his home-made apparatus a long rod of iron running into the ground. Hence the invention of the

lightning rod, dated 1749.

Franklin installed a lightning rod *inside* his house. He put it up "to draw the lightning down into my house, in order to make certain experiments on it, with two bells to give notice when the rod should be electrified." Mrs. Franklin did not fancy having the lightning on such a familiar footing in her house, particularly during her husband's absence.

A trick with which the sage sometimes en-



tertained his friends was the "electric bumper," a thin glass tumbler nearly filled. When the guest brought it near to his lips he received a sharp electric shock.

What Franklin called an "electric jack" was an electrostatic motor strong enough to rotate an iron rod passed through a turkey prepared for cooking. Under date of April 29, 1749, he wrote: "A turkey is to be killed for our dinner by electric shock, and roasted by the electric jack before a fire kindled by the electric bottle."

Many contributions to the realm of pure science were made by Franklin, as, for instance, the theory of the Gulf Stream, which he promulgated; or his astonishing anticipation of the idea, now generally accepted by physicists, that great volcanic explosions cause cold years by filling the upper atmosphere with clouds of ashes that shut off some of the heat of the sun.

Present-day advertisements of bifocal lenses for eyeglasses and spectacles claim that they were invented by Franklin. Which is a fact. In later life, like everybody else, he needed glasses for reading. Being somewhat near-sighted, he used spectacles also for distant vision, and he found it incon-



FRANKLIN THE INVENTOR

An allegorical painting by Benjamin West, an American who was one of the founders of the Royal Academy



THE ORIGINAL STEP-LADDER CHAIR

Franklin made this chair for use in his library. Variations of it are now commonly found in American homes

venient to be constantly changing one pair for the other. So he went to an optician in Paris and had a pair made for him that would serve both purposes.

In Franklin's time the fuel problem was causing not less anxiety than now. To overcome this trouble, Franklin invented what he called the Pennsylvania heater, an apparatus not to be confused with the iron fireplace which has masqueraded under that name. It was a thoroughly scientific contrivance, which took cold fresh air from outside the house, and, after warming it in passages kept hot by the escaping gases of the fire, finally discharged it into the room. If enlarged, slightly altered, and placed in the cellar, it would have become the prototype of our modern hot-air furnaces.

Among the least known of Franklin's inventions was what he called a "swimming anchor," to prevent a ship from driving to leeward in water too deep for an ordinary anchor to find bottom. A contrivance originated by him is in common use to-day in many households in slightly different form. This is a chair that is convertible into a short ladder. Franklin made the first one to reach the high shelves in the library of his house on Market Street, Philadelphia.



OLD LIGHT

Incandescence and Luminescence

BY E. NEWTON HARVEY, Ph. D.
Professor of Physiology, Princeton University

Some years ago a physicist might have pointed out that wireless transmission was very similar to that of light. To-day the point of view is reversed. So popular has radio become, and so general the conception of wave motion and wave length, that we may say that light waves are very similar to wireless waves.

Although wireless waves are only produced under special conditions, every substance above the temperature of absolute zero gives off a series of waves of different wave length. The higher the temperature, the shorter the average wave length. As we gradually heat a bar of steel, we find that at about 525°C . it lights with a dull red glow. If the temperature is raised higher and higher, the color becomes yellow-white, white, and finally blue-white, and so dazzling that dark glasses are required to protect the eyes.

If we examined the light from the dull red steel with a spectroscope, we should find only the wave lengths giving the sensation of red, and the longer waves which do not affect the eye, the infra-red. If we examined the light

of white-hot steel in the same manner, we should find all the colors of the spectrum from red to indigo, the mixture appearing white, and, again some infra-red and some very short wave lengths indeed, the ultra-violet, invisible to the human eye. A very hot substance emits all wave lengths, but a far greater proportion of those which we cannot see. This production of light is dependent solely on the temperature, and consequently we speak of temperature radiation, or *incandescence*.

Practically all of our methods of illumination make use of this kind of light. For example, in the incandescent lamp an electric current is sent through a fine filament of some material whose resistance to the passage of the current raises the temperature of the filament to the point where visible light appears. Improvements in artificial illumination have consisted in finding material for the filament, which can be raised to a higher temperature without melting and without passing off into the form of vapor and leaving a black film on the bulb. However, no matter how high the temperature, there is emitted always a large amount of infra-red and ultra-violet waves. These waves cannot be seen, and consequently this form of illumination, although convenient, is not efficient.

On the other hand, we may have light produced by bodies which are quite cold or merely warm, far below the 525°C . of dull red steel. This is called *luminescence* to distinguish it from *incandescence*.

Radio enthusiasts are familiar with electric discharges in partial vacua. Very little heat accompanies this kind of light. Everyone has seen the faint glowing of a phosphorous match, the radium paint on the hands of a watch, the firefly, or the phosphorescence of the sea. Some crystals will glow when shaken, and some substances produce light when they crystallize from solution. Such luminescences emit not or little infra-red and ultra-violet. They are efficient even if they are faint.

The brightest of these luminescences are produced by living things. The biologist knows that the light of damp wood in forests, the fox fire, is due to



Courtesy Charles Scribner's Sons

A LIGHT-GIVING WORM

The left half of the illustration pictures a *Chaetopterus* as seen in daylight; the right half shows it as it looks in the dark. This animal, which lives in a parchment tube in the mud, gives off a luminescent slime when disturbed

strands of luminous fungus growing on the wood. Dead fish cast up on the beach or kept in refrigerators often glow with a greenish light. This is due to myriads of luminous bacteria living in the fish. We could not see the light from a single bacterium, but where a colony of them is growing vigorously the sum total of all their lights is plainly visible.

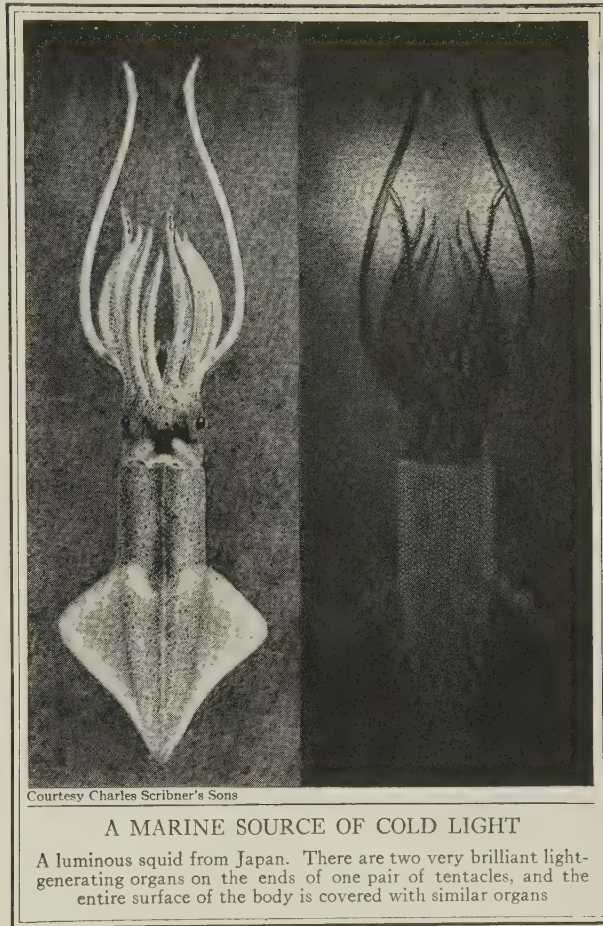
There are many kinds of organisms which produce light, but only a few are favorable for the study of the process. One form, a small crustacean, *Cypridina*, about one-eighth inch long, is unusually good. If dried rapidly, the animals again luminesce with a bright bluish glow whenever the dry material is moistened.

Oxygen is necessary for the luminescence, as no light will appear unless this gas is present. This fact is true for all luminous animals and indicates that the process is an oxidation—that is, a combustion. It is an oxidation of a peculiar kind, for practically no heat is produced, whereas a great deal of heat is produced in the combustion of such a substance as coal.

Cypridina lives in the sea and secretes a fluid into the sea water whenever disturbed. It is this fluid which glows. The temperature of the secretion is less than one-thousandth of a degree greater than that of the surrounding water. Thousands of these creatures projecting their liquid light like the smoke from a tiny gun form a picture of surpassing loveliness.

The liquid contains a substance called luciferin, which is oxidized in the presence of an enzyme, a chemical compound of animal origin, called luciferase, also contained in the secretion. These two bodies can be separated by ordinary methods of chemical procedure and many of their properties are known. They are compounds of carbon, and we may hope some day to make them artificially by synthesis, like so many other organic substances.

Perhaps the most interesting as well as promising thing regarding the chemical nature of animal light has to do with its regeneration. When coal burns, gases are formed which cannot directly be recombined to reform the coal. That reaction was carried out æons ago, when plants of the coal age



Courtesy Charles Scribner's Sons

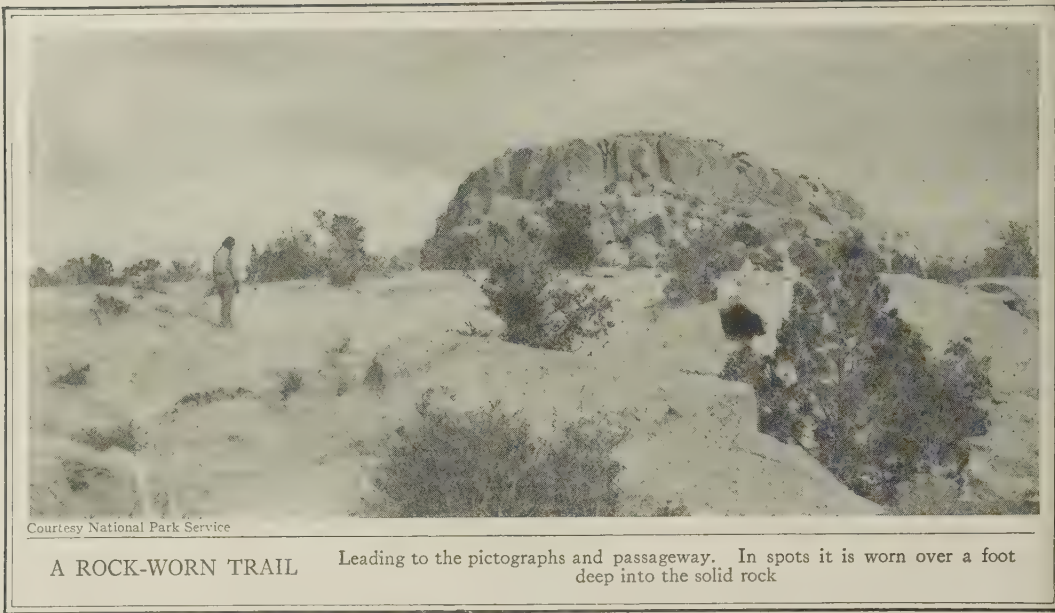
A MARINE SOURCE OF COLD LIGHT

A luminous squid from Japan. There are two very brilliant light-generating organs on the ends of one pair of tentacles, and the entire surface of the body is covered with similar organs

stored up their supply of food material under the influence of sunlight, to be slowly transformed later into the fuel we find so necessary at the present time.

On the other hand, when luciferin burns, no gaseous products of combustion are formed, but only a slight oxidation occurs. The oxidation product, oxyluciferin, can be converted—reduced, it is called—to luciferin again. The reformed luciferin is now ready for reoxidation with light production. Under proper conditions, the processes, the oxidation and reduction, can be made continuous, and a steady luminescence produced. It is very likely that luminous organisms carry out these reactions continuously and use their luciferin over and over again.

Thus we find that nature has developed a light unique in two important respects: efficient in its physical make-up, consisting as it does of only those wave lengths which we can see, and economical in chemical processes, utilizing the same "fuel" over and over again.



Courtesy National Park Service

A ROCK-WORN TRAIL

Leading to the pictographs and passageway. In spots it is worn over a foot deep into the solid rock



THE LAND OF "THE DELIGHT MAKERS"

Bandelier National Monument

BY C. F. TALMAN

Novelists have often drawn upon the rich storehouse of archæology for their scenes and episodes. Few persons have ever written novels for the express purpose of giving archæological information to the world at large. It was this purpose that prompted the writing of what a competent critic, Charles F. Lummis, has called "the most photographic story yet printed of the life of the prehistoric Americans."

"The Delight Makers," Adolf F. Bandelier's charming romance based upon the author's personal study of the aboriginal sites of New Mexico, was published in 1890. The small edition of the book was soon exhausted, and for years copies were rare and costly. Lummis tells us that the copy owned by the Los Angeles Public Library slept in the safe during the six years he served as librarian there. Fortunately a second edition has since appeared, so that the book is now easy of access. It should be read by everybody who plans a visit to the fascinating region it describes.

When the story was written, very few white men had penetrated this region, though it lies within twenty miles of the ancient city of Santa Fé. That was the day when people still thought of the Cliff Dwellers, whose prehistoric homes abound in New Mexico, as an extinct race, totally different from the In-

dians. The Pueblos of the Rio Grande knew better, for they traced their descent from this very race. It was partly through long intercourse with the Pueblos, and partly through laborious exploration of the ancient sites, that Bandelier and a few others were able to piece together the story of human habitation in the American Southwest, and to prove that the mysterious Cliff Dwellers were, in fact, Indians who differed little in their characteristics and their mode of life from the Pueblo Indians of to-day. Bandelier's tireless study of these aborigines ended only with his life, for when he died, in 1914, he had gone abroad under the auspices of the Carnegie Institution to search the Spanish archives for still further information bearing on the subject.

Other archæologists and ethnologists have been busy at the same great task of recovering from oblivion the remote past of the Pueblo people, and to-day there is a flourishing institution at Santa Fé—the School of American Research—which devotes most of its attention to a study of the neighboring cliff dwellings. This region is, in fact, rapidly becoming a sort of American Pompeii or Valley of the Kings. Bandelier was, however, the acknowledged leader in this field, and when a tract containing the most remarkable cliff dwellings of New Mexico was set aside

few years ago as a government reservation, it was fittingly named the Bandelier National Monument.

Here is a region as well worth the attention of the traveler as any site of antiquarian research in the Old World. It lies just west of the Rio Grande, in a setting of marvelous scenic beauty. The country is a lofty plateau, cut by deep canyons. On account of the great altitude the climate is comfortably cool even in midsummer. The "monument" consists of three separate areas, all reached by good automobile roads leading from Santa Fé. The nearest railway station is Buckman, on a branch of the Denver & Rio Grande Railroad. As

the whole of the reservation is within the limits of the Santa Fé National Forest, it comes under the jurisdiction of the United States Forest Service, and not that of the National Park Service.

The traveler will visit, first of all, the famous Rito de los Frijoles, the principal scene of Bandelier's story, in which it figures under the native name of Tytonyi. The Rito is a deep gorge, about six miles long, cut by a stream which rushes down by a series of cataracts to the Rio Grande. There is a narrow strip of level land along the stream, upon which, with the aid of a crude system of irri-



Courtesy U. S. Forest Service

ENTRANCE TO A CLIFF DWELLING

Most of these caves have been carefully explored and in two hundred of them a recent expedition found, under ten or twenty coats of plastering, wall decorations and frescoes that rival those found in the caverns of southern France and Spain



Courtesy Denver & Rio Grande Railroad

PICTOGRAPHS AND PASSAGEWAY AT TSANKAWI RUIN

The figures are cut an inch deep in the rock and undoubtedly were intended to frighten away enemies from the winding passageway which the Indian is entering. The passage is cut in the solid rock, and is just wide enough to permit one man to pass. It winds to the mesa where are found the ruined dwellings of the prehistoric race

gation, the former inhabitants managed to raise crops sufficient to support a population of from fifteen hundred to two thousand people. The village that once occupied this canyon was probably the largest aboriginal settlement in the whole of the Southwest.

The northern side of the canyon is a vertical cliff of white pumice several hundred feet in height. The face of the cliff is honeycombed with caves, scooped out of the soft rock, and at its base are the ruins of houses built of blocks of the same material. Many of the old dwellings were a combination of house and cave. Besides these homes in or adjacent to the cliff, there was one great elliptical struc-

ture standing out in the valley, which, with its hundreds of rooms, constituted a veritable apartment house. The ruins outline the ground plan of what was originally a building of three or four stories. High up on the side of the cliff is the Ceremonial Cave, in the floor of which is sunk a circular *kiva* of the type common in both ancient and modern Pueblo settlements. The *kiva* is at once a sanctuary and a lounging place for the male members of the tribe. Here, as well as among the dwellings at the foot of the cliff, a considerable amount of restoration has been carried out by the

School of American Research, so that the visitor gets an actual view of the scenes among which the ancient inhabitants passed their days.

South of the Rito the Bandelier Monument contains the remains of several other primitive settlements. In this outlying tract the objects of greatest interest are the Cueva Pintada, or Painted Cave, the walls of which are covered with pictographs in red, white, and black, and the two "stone lions of Cochiti," life-sized images, much mutilated, of pumas or mountain lions, revered by Pueblo hunters as their patron deities.

Two separate areas of the monument, a few miles farther north, contain, respectively, the ruins of the settlements of Otowi and Tsankawi, which included both cliff dwellings and extensive groups of houses on the summits of the mesas. Near Otowi is the strangest sight to be found in the whole region—a cluster of conical formations of white tufa, like giant beehives, from ten to fifty feet in height, known as the Tent Rocks. They are full of caves, both natural and artificial, and some of them were once used as dwellings. Lastly, some six miles north of Otowi are the ruins of Puyé, another large cliff village, whose inhabitants wage a thrilling battle with those of Tyuonyi in the pages of Bandelier's story. This place includes a big pueblo built on top of a mesa and quantities of cave dwellings hollowed out of the face of the cliff. A vast number of small

holes now seen in the vertical rock were probably intended for the insertion of timbers used to support porches or balconies.

The dates of all these ruined settlements are uncertain, but they run centuries back of the discovery of America. According to one hypothesis, the villages were abandoned between six hundred and eight hundred years ago, on account of climatic change involving the partial drying up of the streams on which the Indians depended for irrigating their crops.

The Forest Service will permit you to camp anywhere you like on the national monument, except on areas immediately adjoining the hotel near the Rito.

Read "The Delight Makers," visit the Bandelier Monument, and then study the relics and models of prehistoric Pueblo culture in the museum at Santa Fé. Thus you will accomplish the nearest American parallel—as a visualization of ancient life—to reading "The Last Days of Pompeii," visiting the disinterred Vesuvian city, and inspecting the Pompeian antiquities in the National Museum at Naples.

If you wish more serious literature on the archæology and natural history of this region, you will find it in the shape of publications issued by the Bureau of American Ethnology (Smithsonian Institution, Washington, D. C.) and various documents published by the School of American Research at Santa Fé.



Courtesy National Park Service

THE RUINS OF PUYÉ ❧

This spot, which figures in Bandelier's novel, lies some miles north of the Bandelier Monument. Partially excavated dwellings on the top of the mesa can be seen. There are also many ruins of dwellings on the cliff forming the side of the mesa

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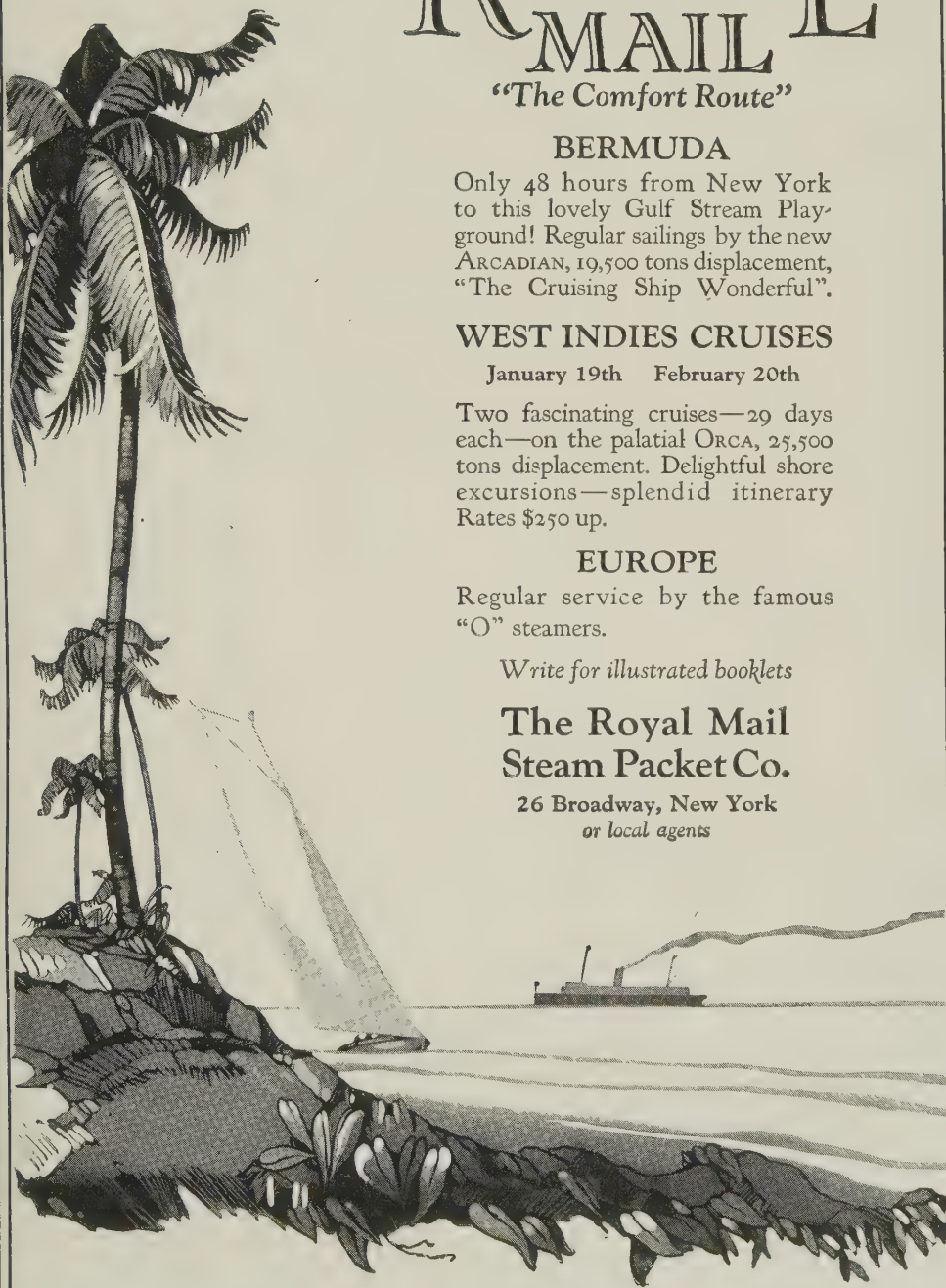
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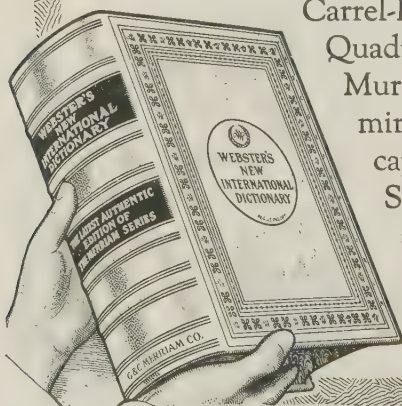
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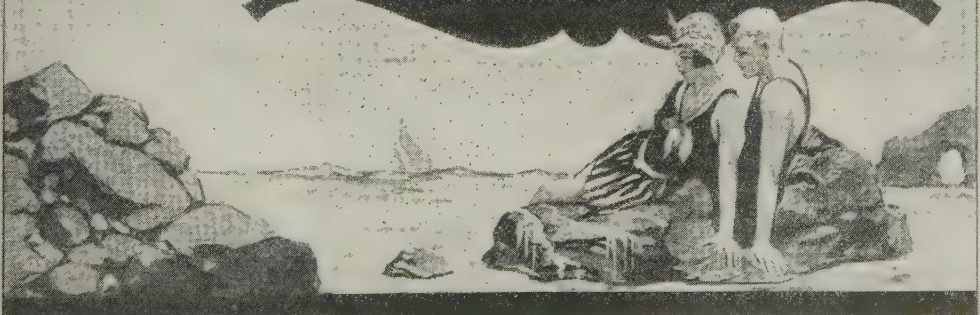
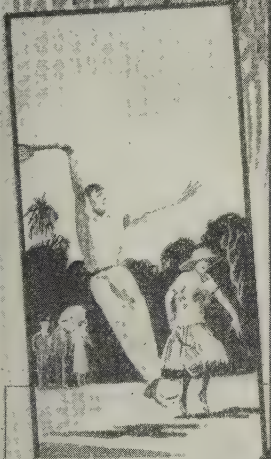
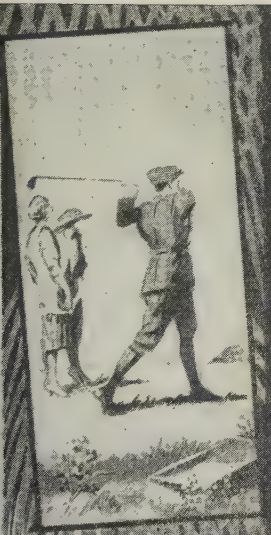
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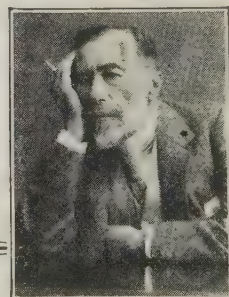
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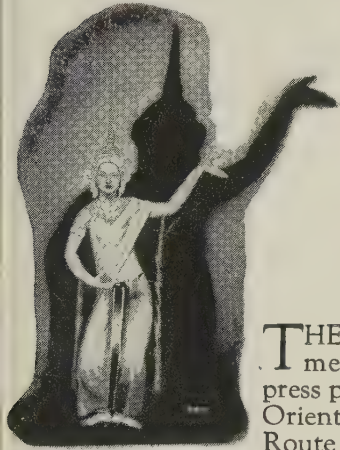
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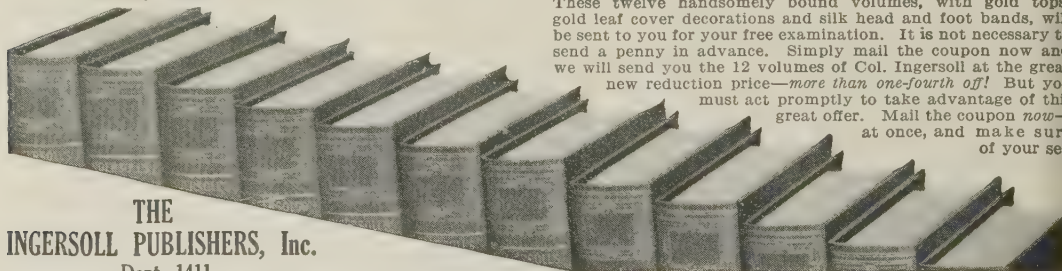
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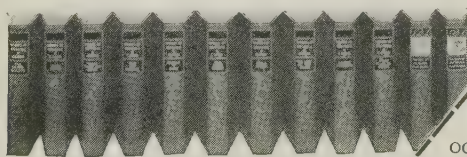
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Do Your Friends "Feel Sorry" for You?

YOU are meeting new people every day—on the street, in the home, at various functions indoors and out. Every time you are "invited" *some one* stands sponsor for you. Every time you attend a social gathering, a party, a dinner, a dance, *someone* believes, or at least hopes, that you will do and say the right thing.

Do you live up to these expectations? Are you perfectly poised, self-confident, well mannered, a delightful companion or guest—or must your friends secretly apologize for your awkwardness and lack of breeding? Must they *always* be making excuses for your mistakes in social deportment? Must they go on forever "feeling sorry" for you?

The person who knows the correct forms of social usage is never a source of discomfort or pity, either to his friends or to himself. He is never timid, "tongue-tied," ill at ease among strangers. He never finds himself stumbling and blundering at the very moment when he wants to make a good impression. Always calm, perfectly poised, sure of himself, he is never at loss for the right word, the proper action, no matter what unexpected condition may arise.

Are You a Welcome Guest?

To know what to do, say, wear, at all times and on all occasions, is to display those signs of gentle good breeding which people of culture and refinement approve.

Are you a welcome guest in the most highly respected circles? Do you know how to impress others with your dignity, grace and charm, whether in the theatre, on the street, at the dinner table, in the ballroom, wherever you may be? Do you converse smoothly and entertainingly? Do people seek you out, enjoy your company? Is your every word and act faultless, pleasing, beyond reproach?



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Do you know how to introduce men and women correctly? On what occasion, if any, a man may hold a woman's arm when they are walking together? How to take leave of the hostess after an entertainment? What to say to your partner in the ballroom after the music ceases? Whether olives should be eaten with the fingers or a fork? Whether a man recedes or follows a woman down the aisle at the theatre? Whether she may be left alone during an intermission? These are but a few of the hundreds of embarrassing problems which are solved for you in the Book of Etiquette.

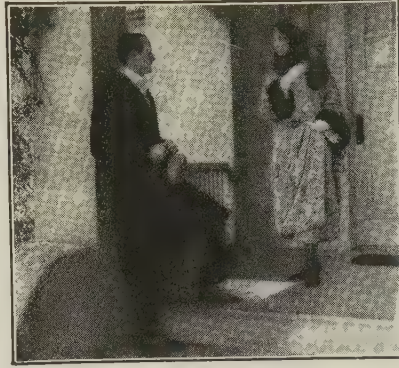
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Shall She Invite Him In?

She doesn't know. They have spent a delightful evening together. Might they not prolong it a little? She would like to, and plainly so would he. But what should one do under such conditions? Should he ask permission to go into the house with her? Should she ask him to call at some other time? What does good usage say is the proper thing to do?



Are You Ever Tongue-Tied at a Party?

Have you ever been seated next to a man or woman at a dinner and discovered that there wasn't a thing in the world to talk about? Does the presence of strangers "frighten" you—leave you groping desperately for words that will not come? When in the company of strangers are you suddenly stricken dumb?



What's Wrong With This Picture?

Good breeding—or the lack of it—is as quickly detected on the street as anywhere else. There are good manners and bad even in the simple matter of walking in public. Is it ever permissible for a man to take a woman's arm? When walking with two women, should a man take his place between them? Your ability to answer these questions is a fair test of your knowledge of what is the correct thing to do.

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And yet, one of these women is invited seldom to go out. She belongs to no set or club or society. She is lonely all day long.

The other woman is always the center of a group of friends. Her calendar is full of engagements. She is sought after as a guest and admired as hostess.

Make Her Secret Your Own

Her secret is very simple. She has learned how to attract people. She has read many things. Her mind is keen and alert, and people feel instinctively that she is worth knowing.

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"I can understand that," you may say, "but I have no chance now to go to college. I cannot spend long hours in a library, nor afford to buy hundreds of books."

None of these things is necessary. It is possible to secure, all at once and at very small expense, the few great books that enable anyone to think clearly and talk well. You will understand how this is possible the moment you have read a wonderfully interesting book called "Fifteen Minutes a Day," which gives you the contents, plan and purpose of the most famous library in the world,

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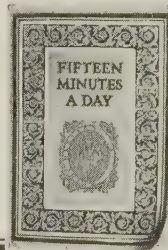
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THE OPEN LETTER



AVE you ever considered what the average man is worth—not in dollars, or sense, but as a catleman would value him, in terms of so many pounds “on the hoof”? According to a chemist’s estimate he is worth about \$8.50 if he weighs 150 pounds, and about \$10 if he weighs 200. Our chemist—a rank iconoclast, I call him—asserts that a man weighing 150 pounds will have in him:

Enough iron to make a three-inch nail.
Enough salt to fill a salt cellar.
Enough sugar to fill a small sugar bowl.
Enough lime to whitewash a chicken coop.
Enough phosphorus for a dozen matches.
Enough magnesia for one dose.
Enough albumenoids to replace the whites of 100 eggs.
Enough fat to fill a ten-pound can.

Shylock was right then when he said that a pound of man’s flesh was “not so estimable, profitable neither, as flesh of mutton, beefs, or goats.”

But man is more than flesh and bone: he *thinks* and *does* things. To illustrate: Suppose pig iron is worth \$20 a ton. When it is made into horseshoes it is worth \$90 a ton; into knife-blades, \$200 a ton; into high-quality steel watch-springs, fully \$1,000 a ton. Raw material is worth \$20; *brains and manual skill count for \$980.*

The artist Millet used a bit of canvas and paint that cost not more than \$5. The mere manual labor of painting a picture on the canvas was certainly not worth more than \$150. The picture he painted was called “The Angelus,” and it sold finally for \$145,000. The raw material was \$5; the hand labor, \$150; and the *genius* that conceived and executed the work, \$144,845.

Everywhere in life the money values make the same spectacular leaps when skill, brains, or genius is engaged. While then a man who

does nothing but breathe and eat is estimated as worth only \$8 to \$10 according to weight, there is no apparent limit to the money value he may attain through skill, brains, or genius.

But what is the *real* value of a man? It is certainly not in the dollars he earns. That is simply his value to himself. A man’s *real* value must be in what he gives, of himself in genius, in brains, in skill, or in manual labor to the world—in short, in *Human Service.*

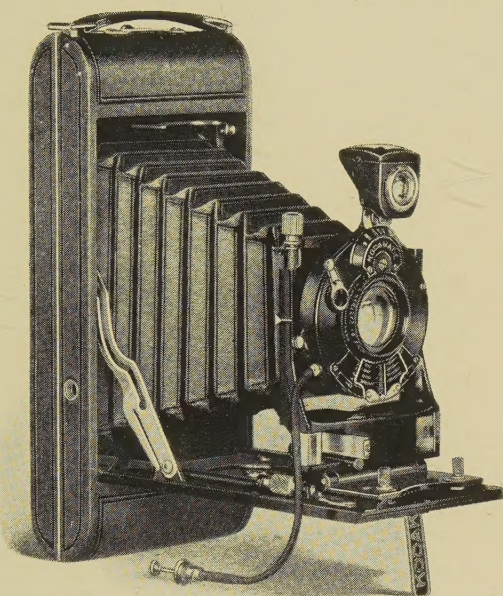
Millet got mighty little of the \$145,000 paid for “The Angelus.” He didn’t get much for any of his pictures; the money values grew with time. But he dedicated his art to humble peasant life and labor, and enriched the world with immortal paintings.

Abraham Lincoln earned and saved money—a considerable sum for his day—but it wasn’t the money that made his value. He *gave his life* to a vital human cause, and it is by that service that his value is appraised in the eternal records.

In the field of manual labor the same holds true. A railroad contractor in wild mountain regions, building against nature’s hardest obstacles, makes his pay, but his *real* value is in opening up new lines for commercial progress and civilization.

In every line of endeavor it is not dollars but devotion that determines the true value of a man. A man can easily fool himself about his value. He knows what his bank account is, and he may measure his worth by that; but the scales in which his *real* value will be weighed are in the hands of his fellow men.

W. D. Moffat
• Editor



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